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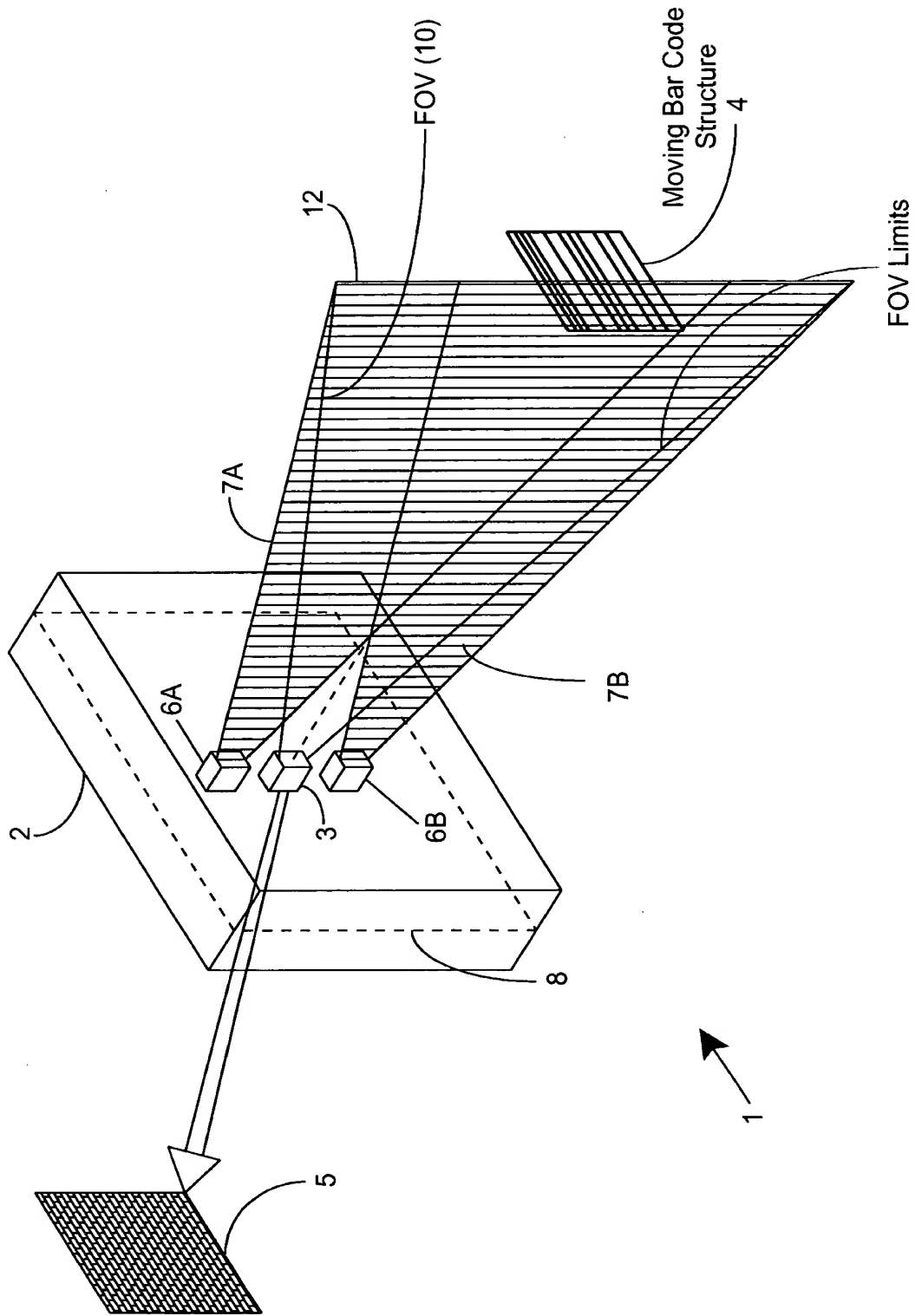
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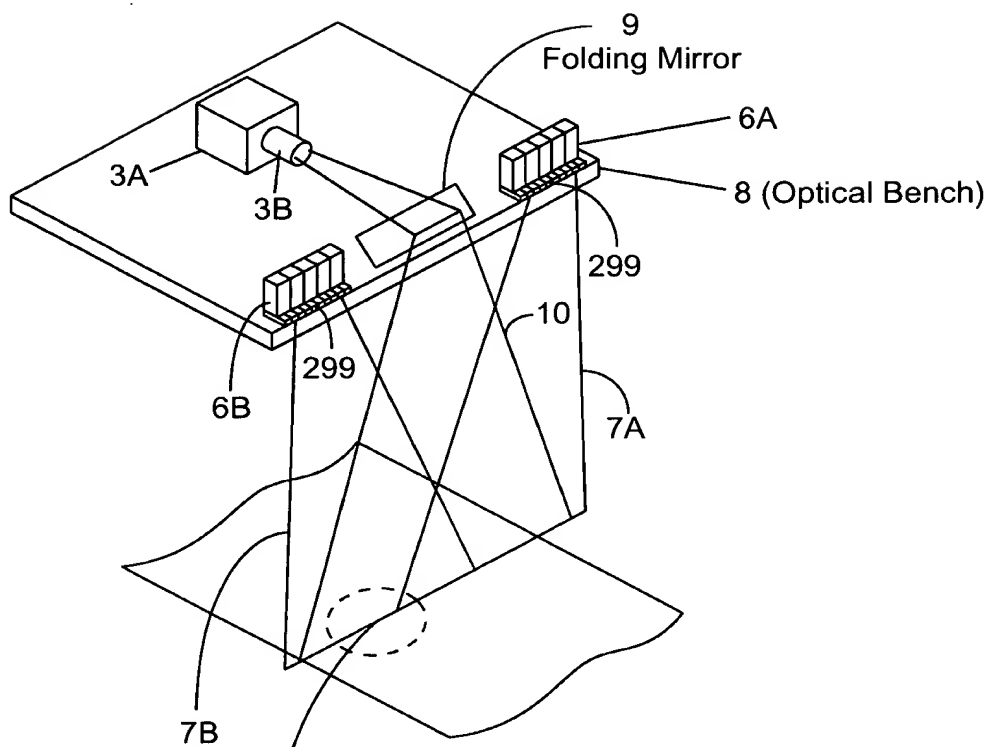


FIG. 1B1

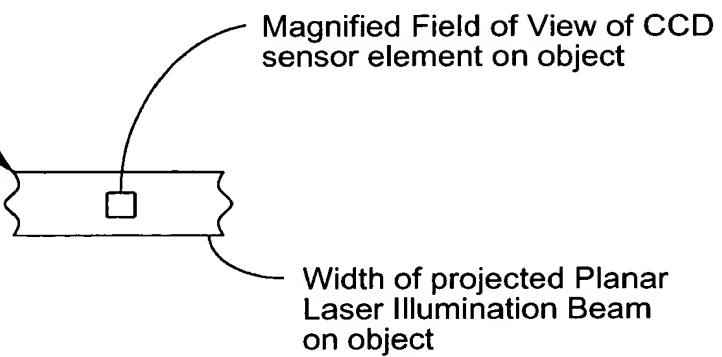
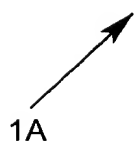


FIG. 1B3

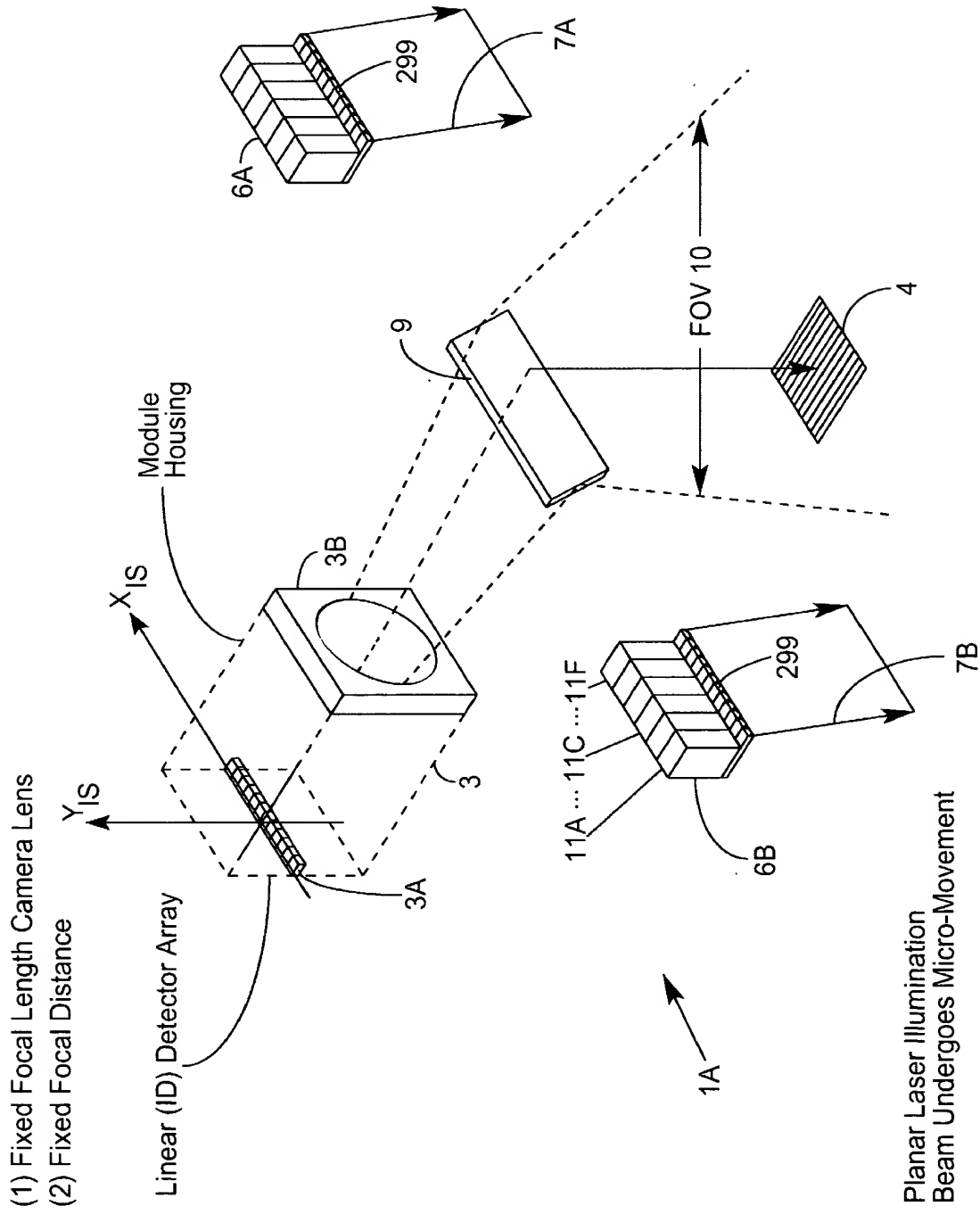


FIG. 1B2



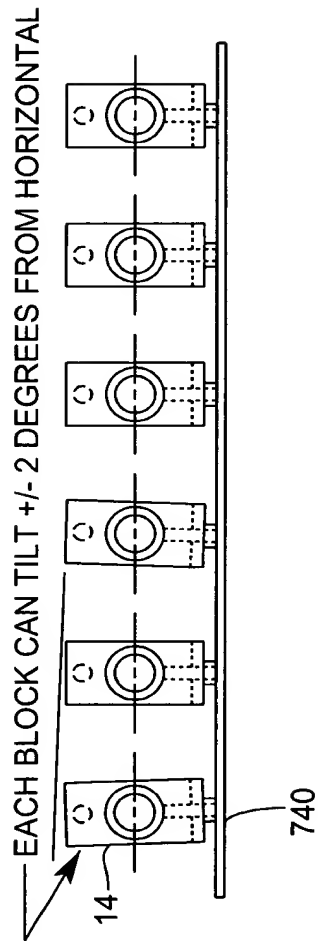


FIG. 1B4

VLD BLOCK CAN PITCH FORWARD FOR ALIGNMENT WITH OTHER VLD BEAMS

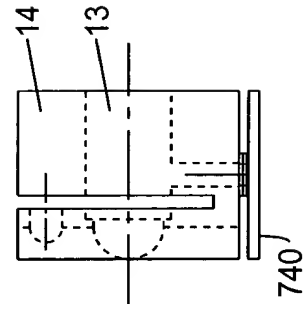


FIG. 1B5

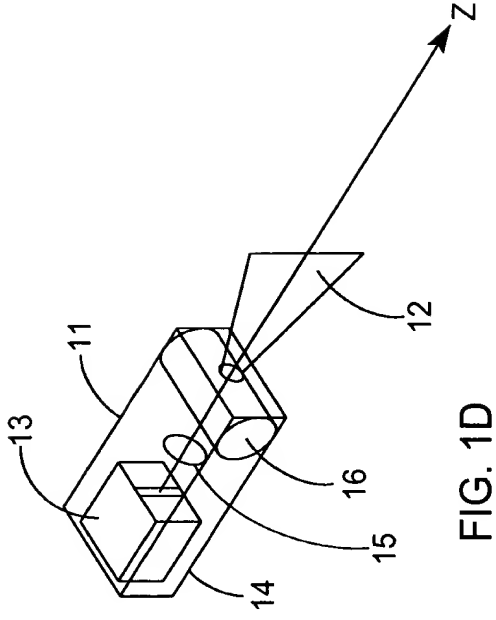
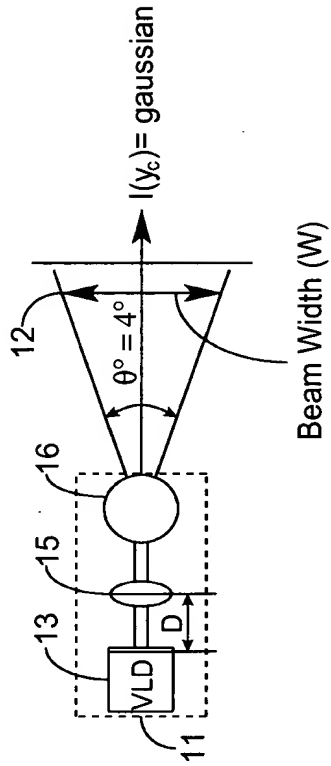
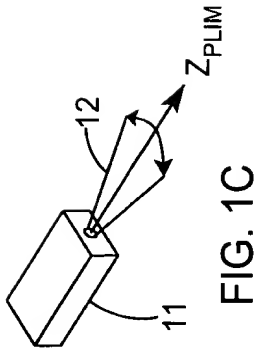


FIG. 1E1

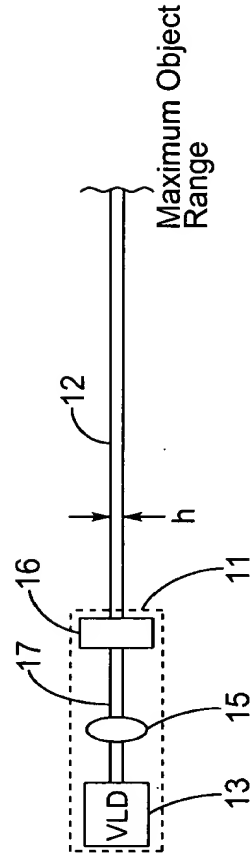


FIG. 1E2

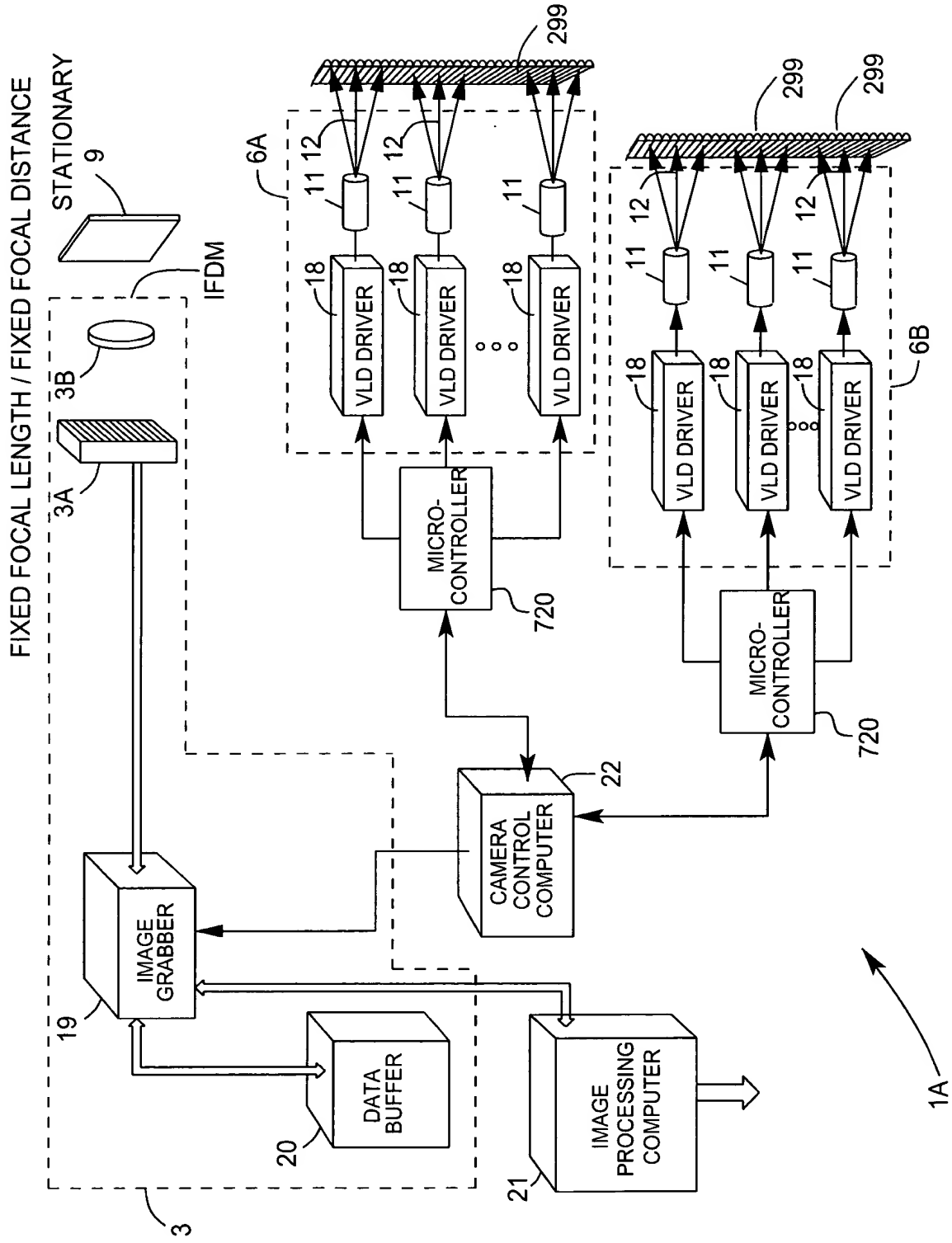


FIG. 1F

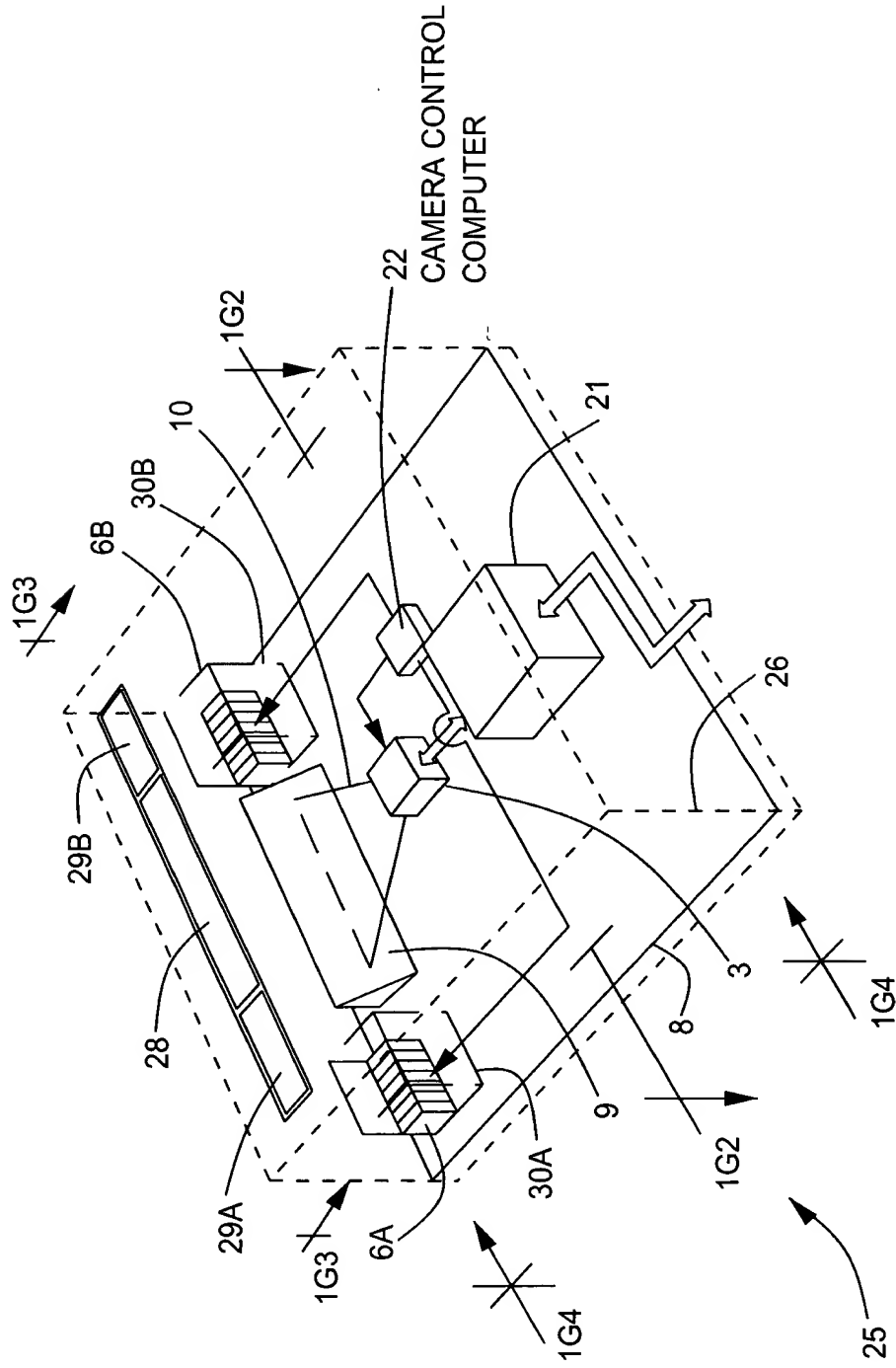


FIG. 1G1



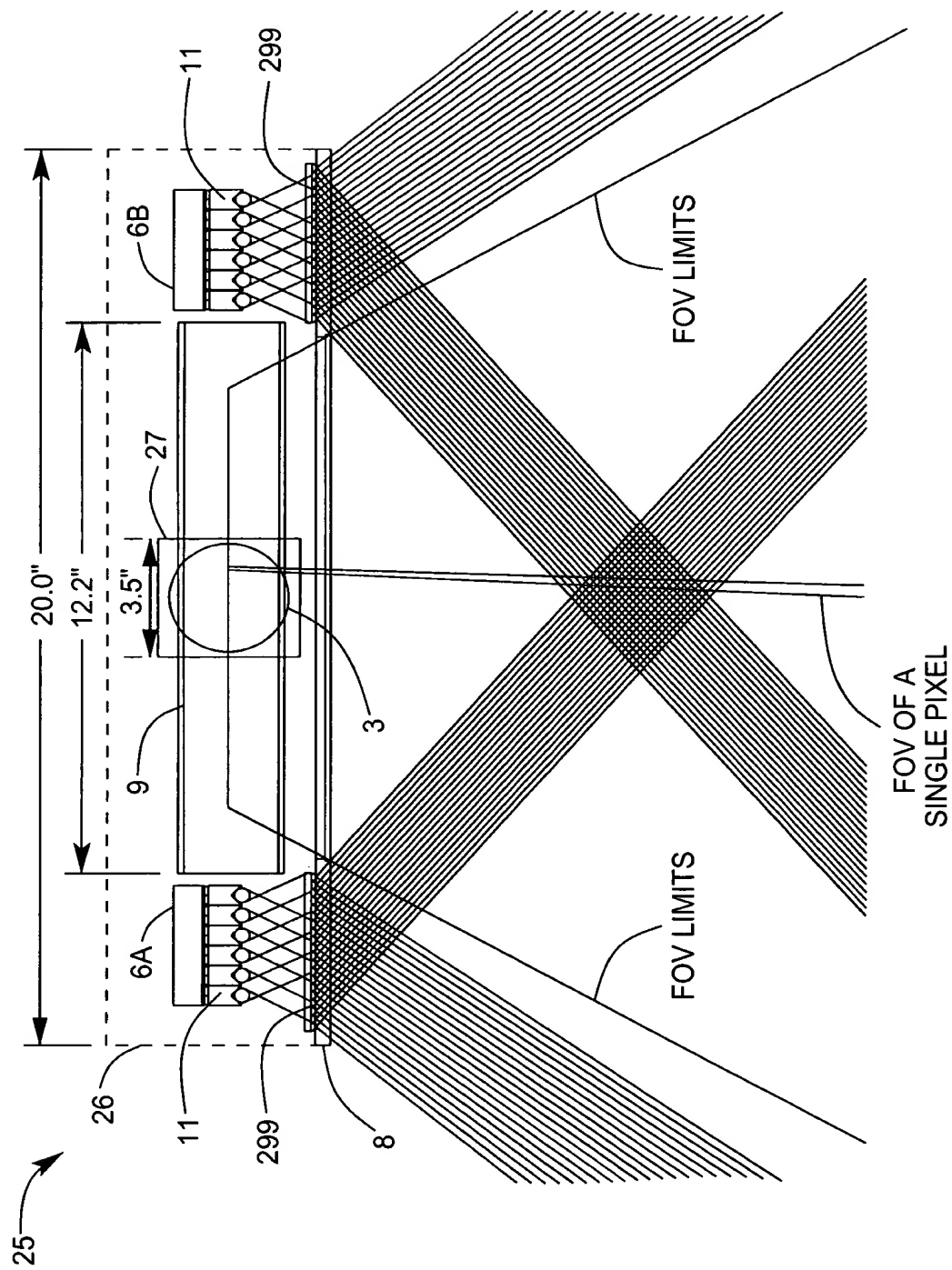
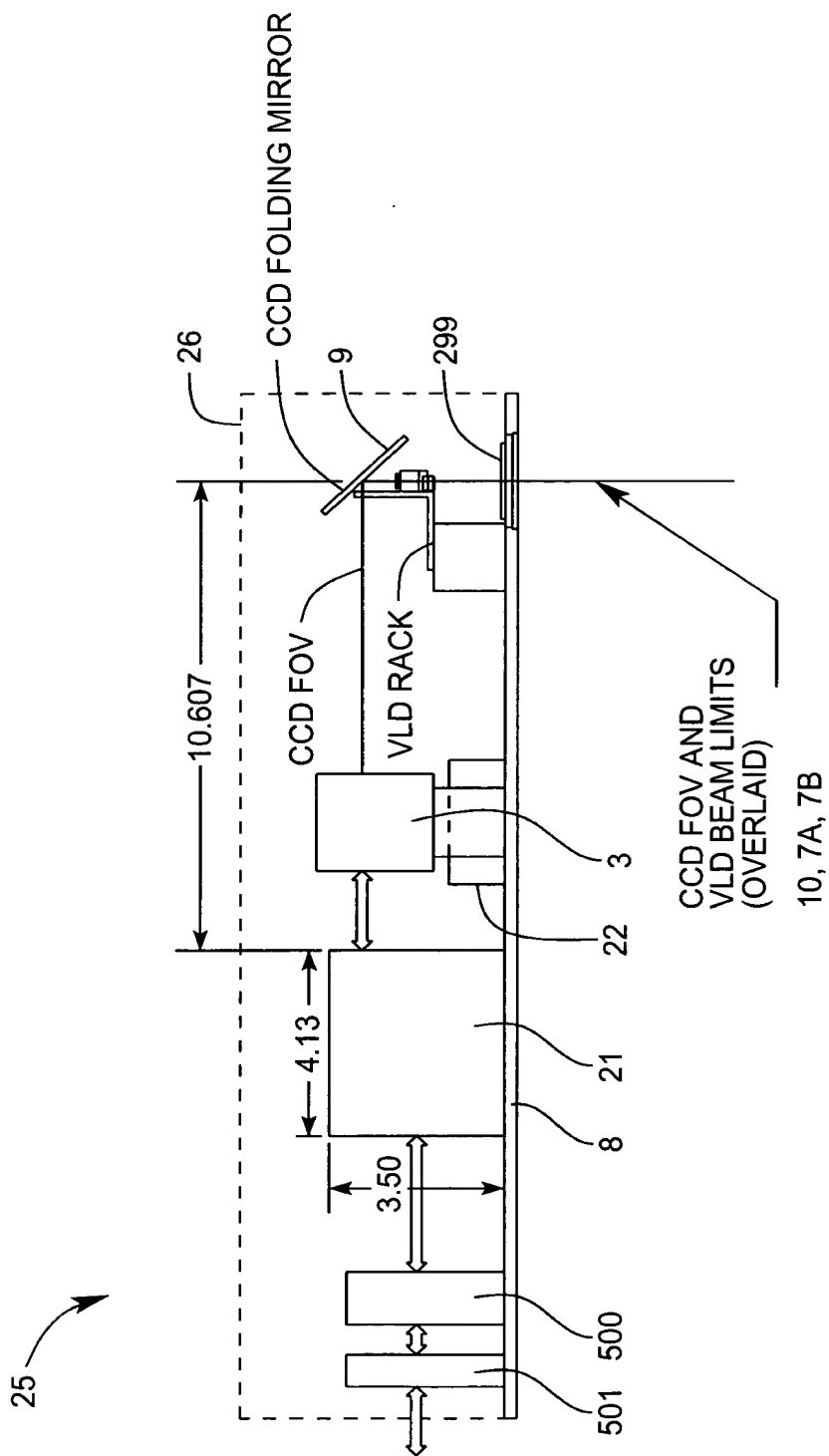


FIG. 1G3



**FIG. 1G4**

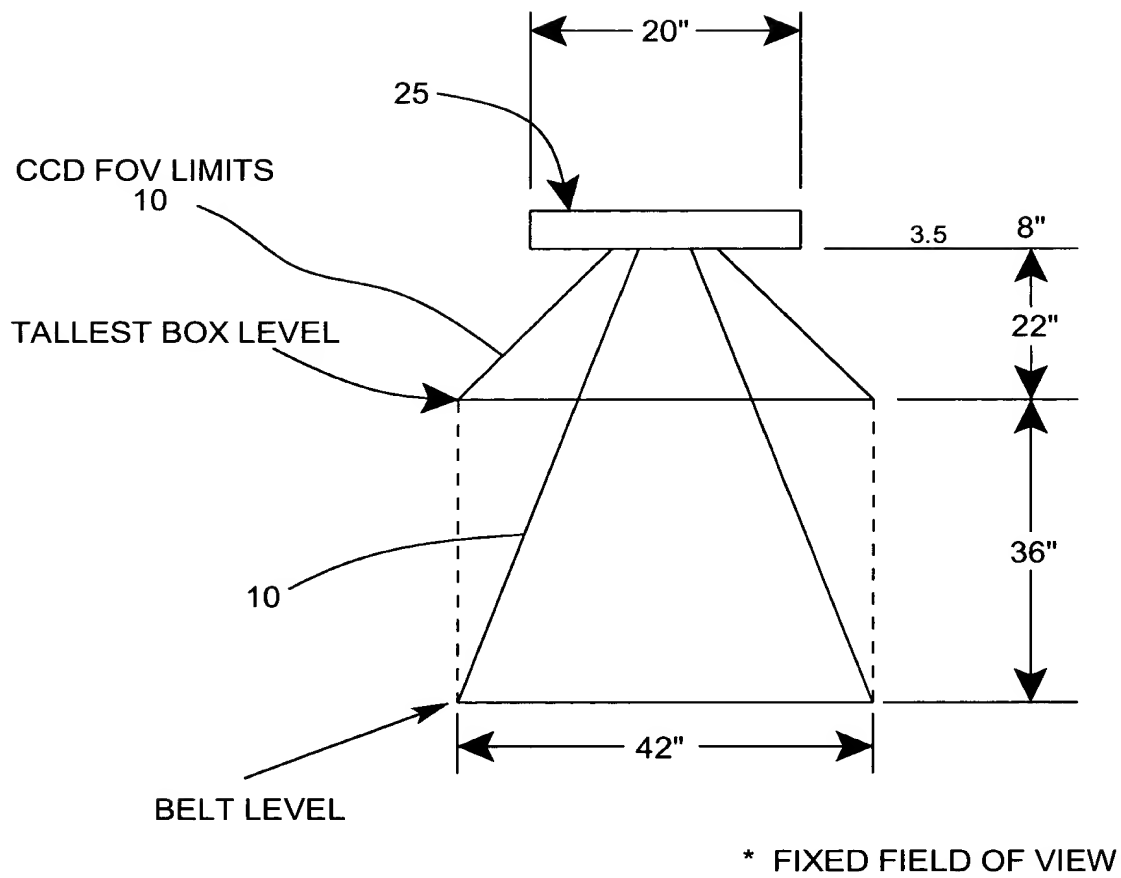
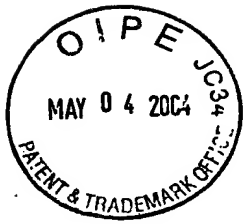


FIG. 1G5



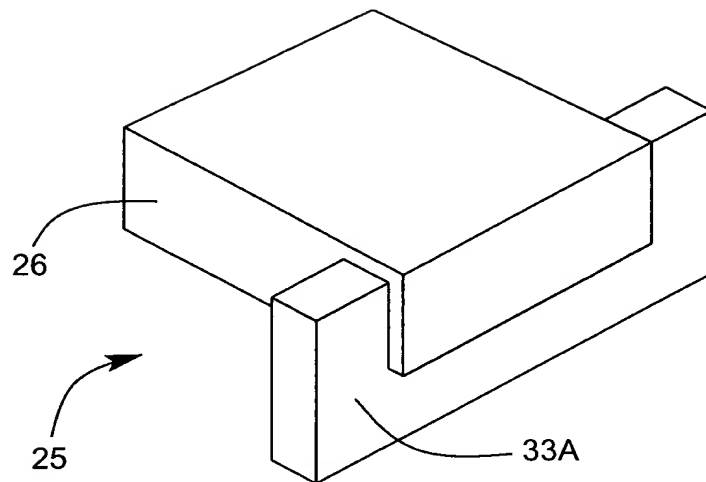


FIG. 1G6

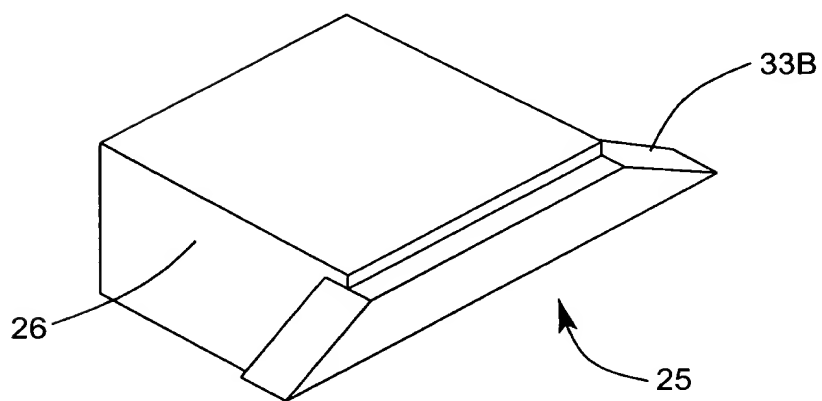


FIG. 1G7

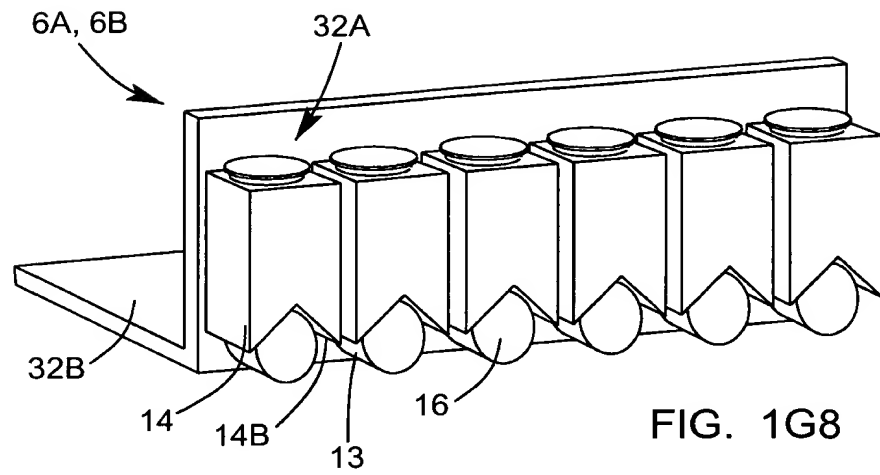


FIG. 1G8

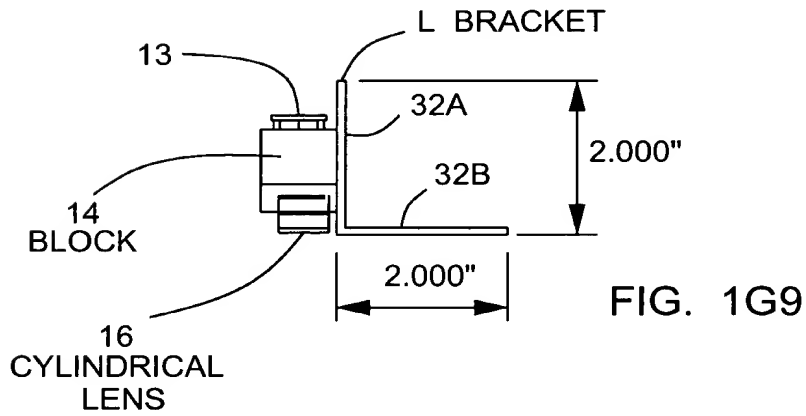


FIG. 1G9

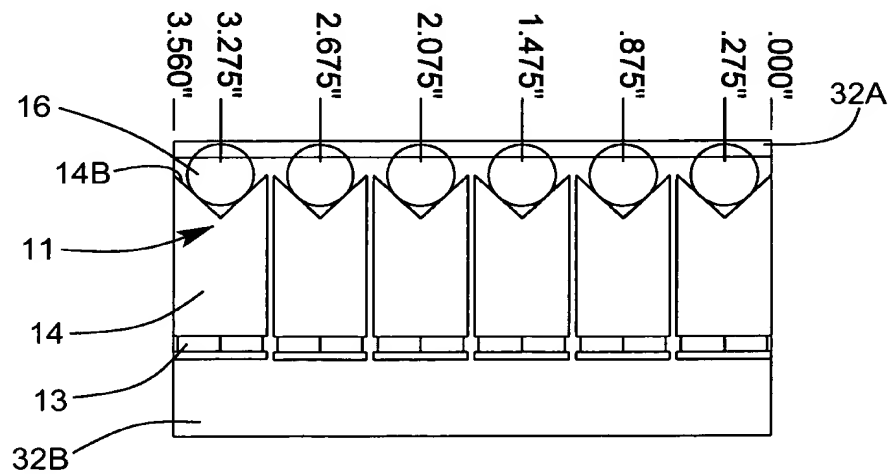


FIG. 1G10

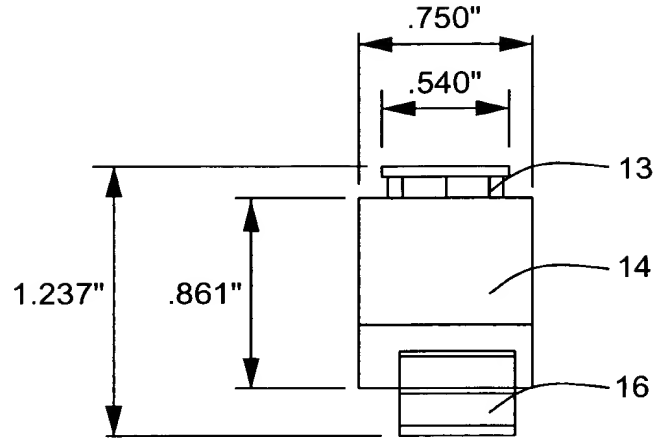


FIG. 1G11

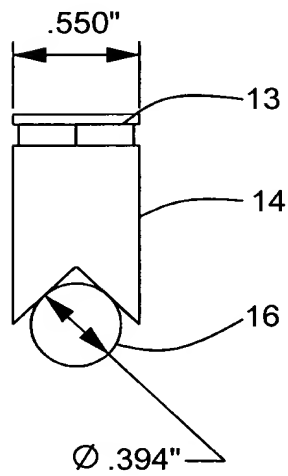


FIG. 1G12

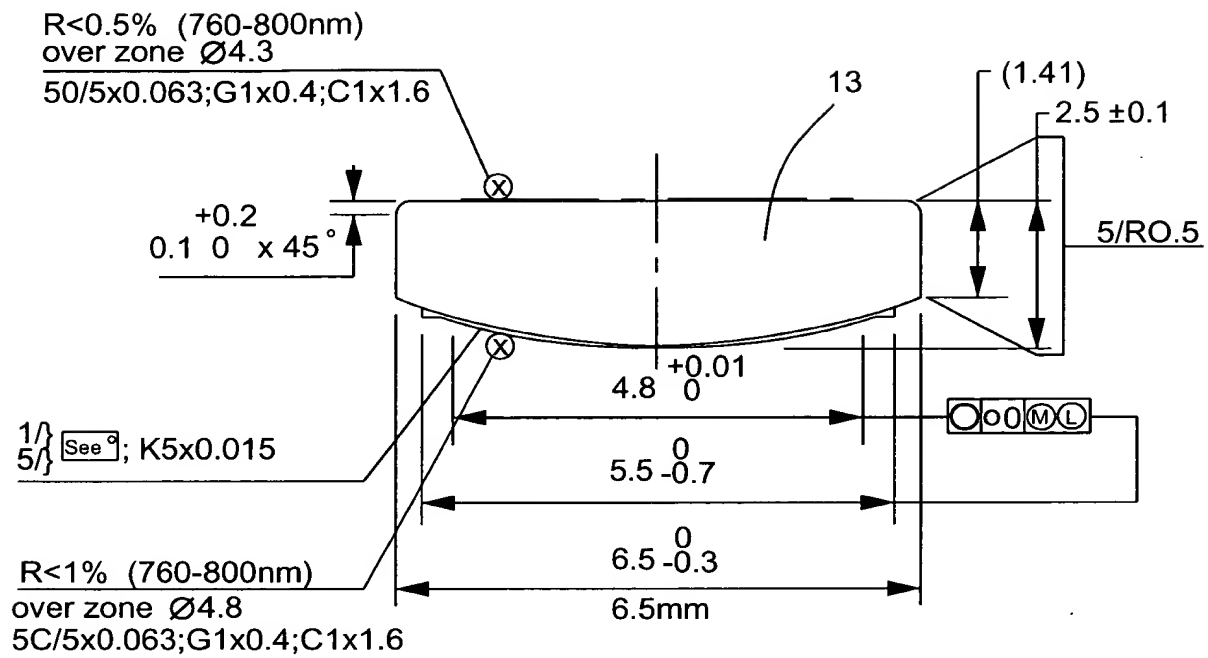


FIG. 1G13

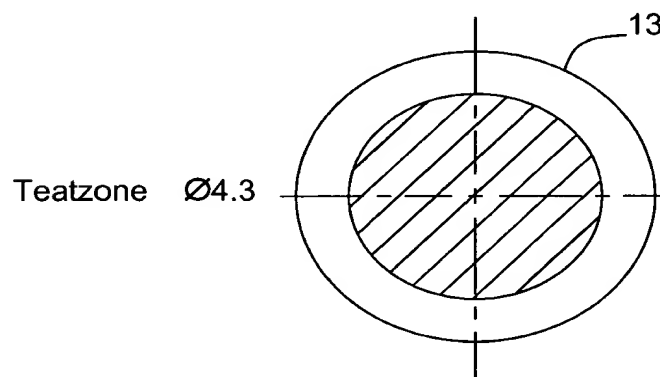


FIG. 1G14

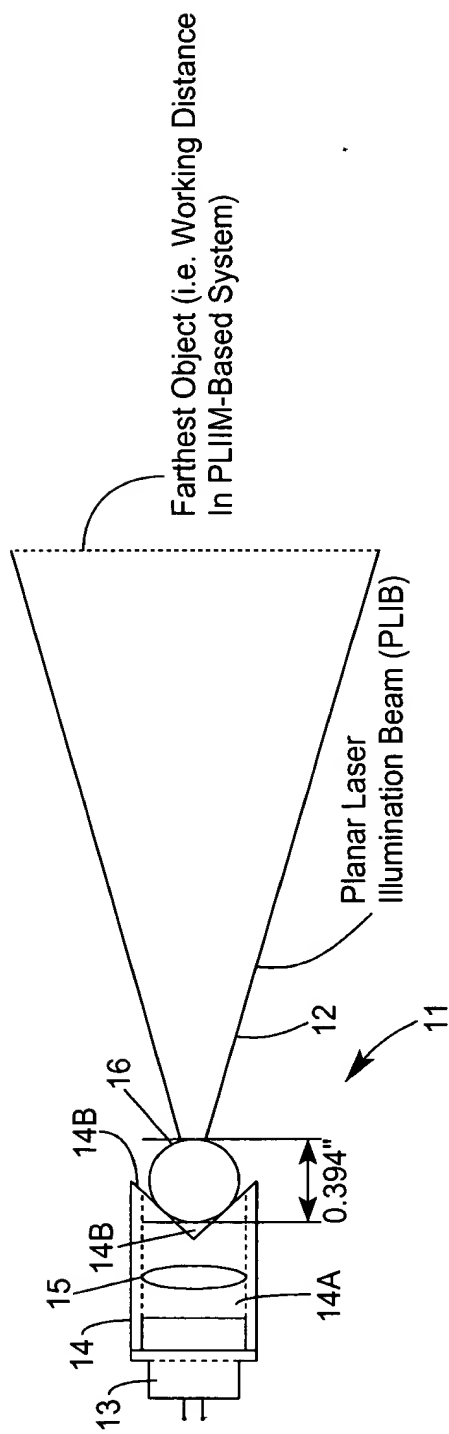


FIG. 1G15A

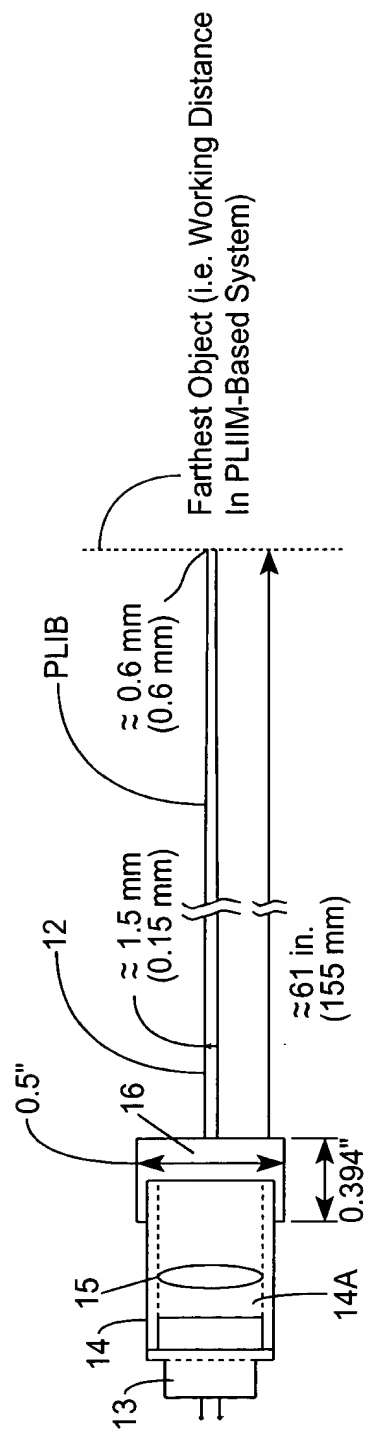


FIG. 1G15B

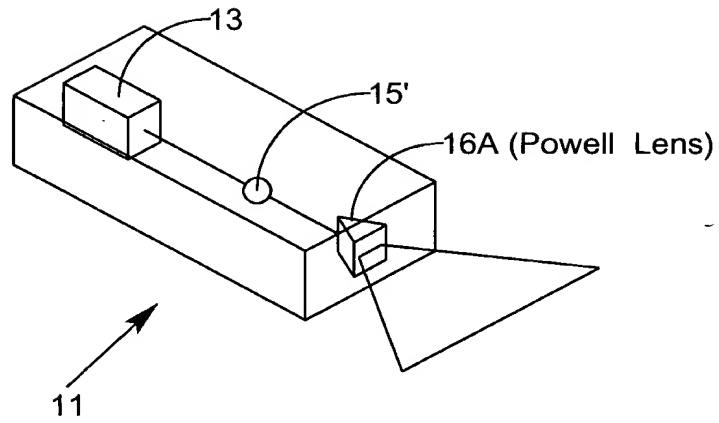


FIG. 1G16A

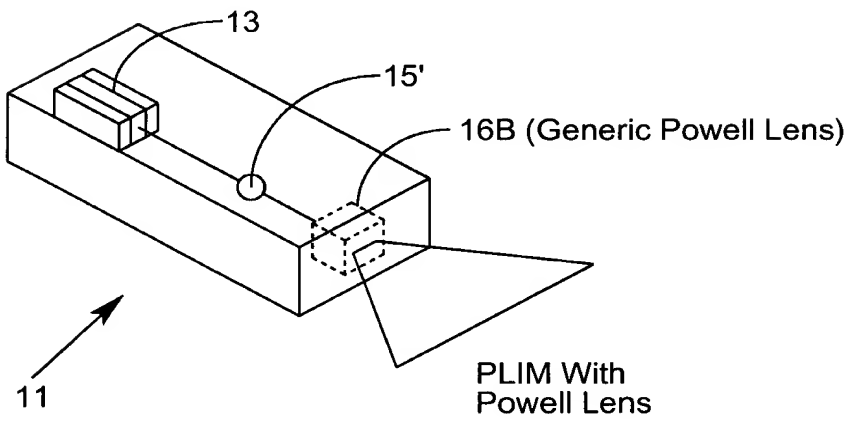


FIG. 1G16B

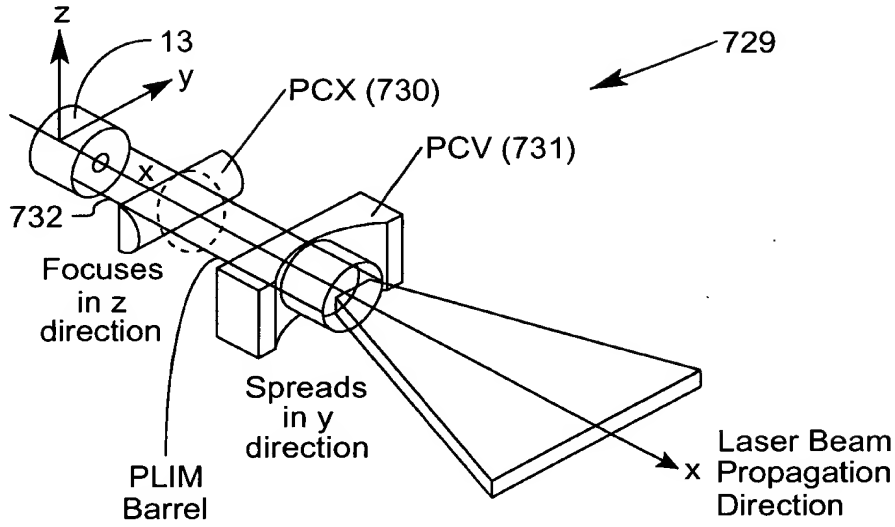


FIG. 1G17A

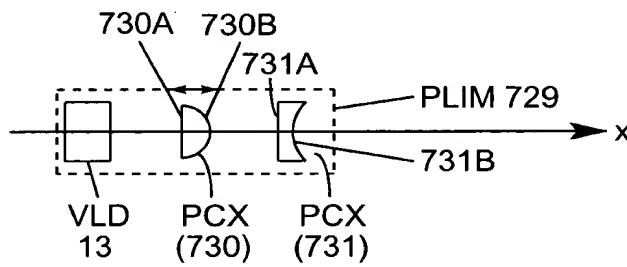


FIG. 1G17B

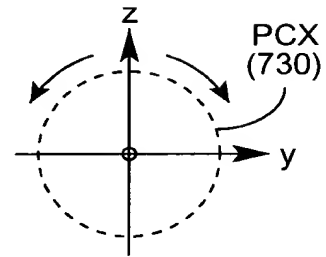


FIG. 1G17C

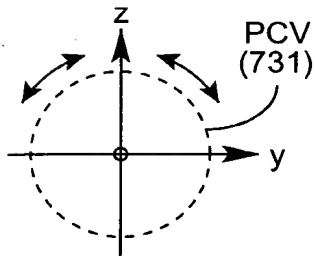


FIG. 1G17D

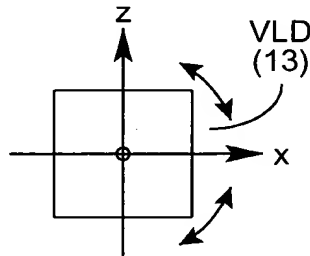


FIG. 1G17E

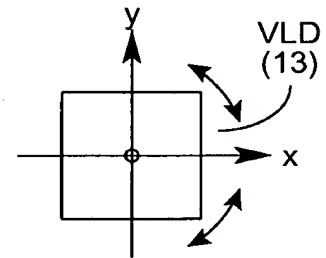


FIG. 1G17F

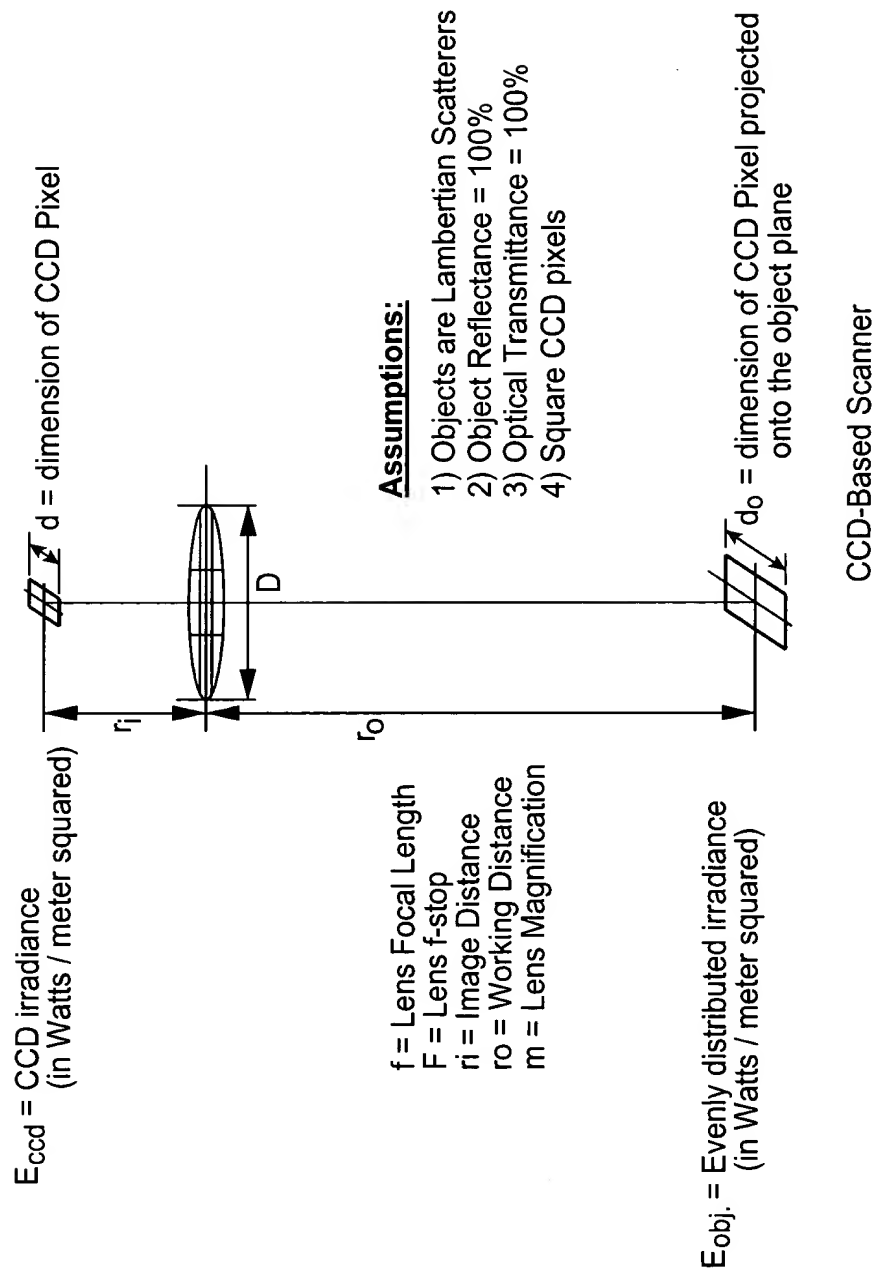


FIG. 1H6



FIRST GENERALIZED METHOD OF REDUCING  
 SPECKLE-NOISE PATTERNS AT IMAGE DETECTION  
 ARRAY OF THE IFD SUBSYSTEM (3)

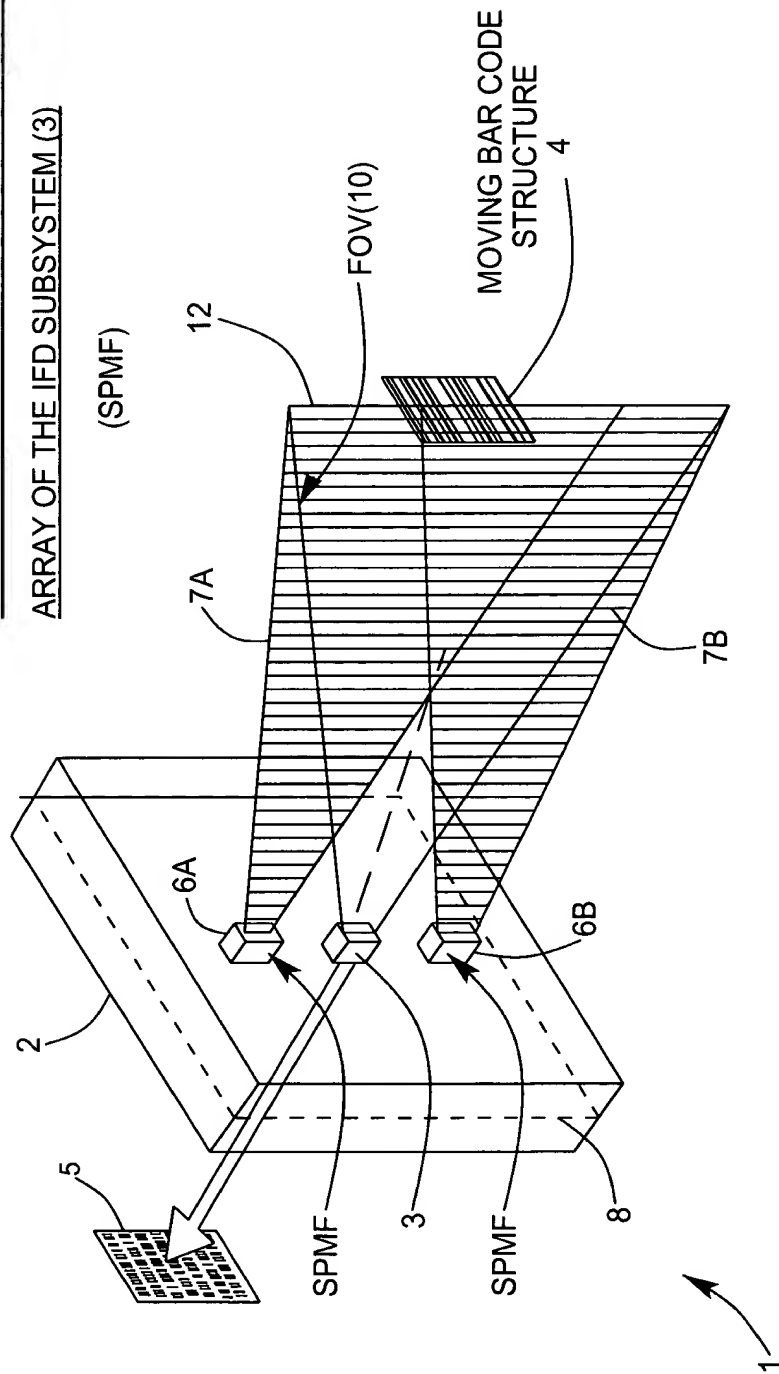


FIG. 111

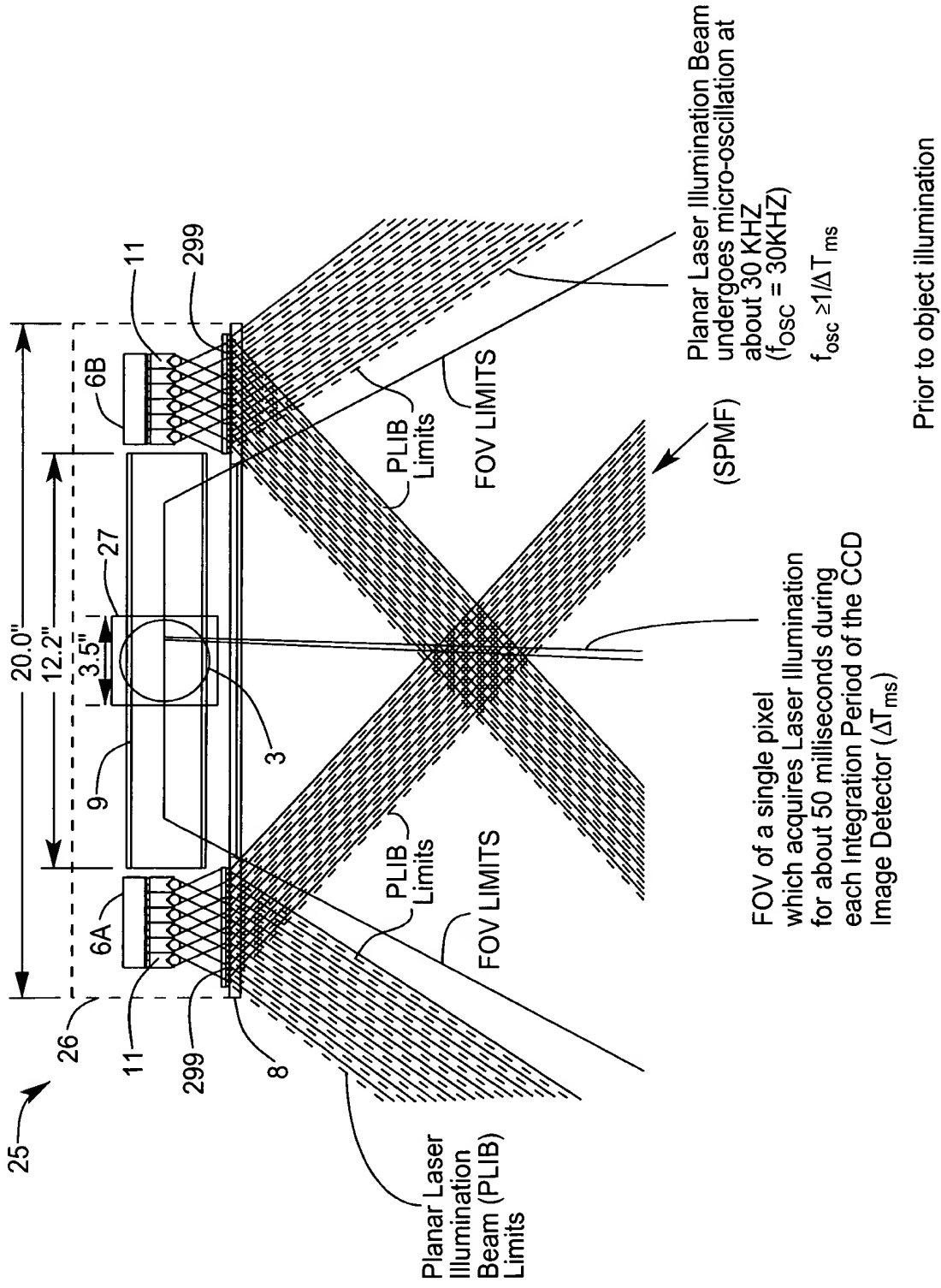


FIG. 112A



THE FIRST GENERALIZED SPECKLE-NOISE PATTERN REDUCTION  
METHOD OF THE PRESENT INVENTION

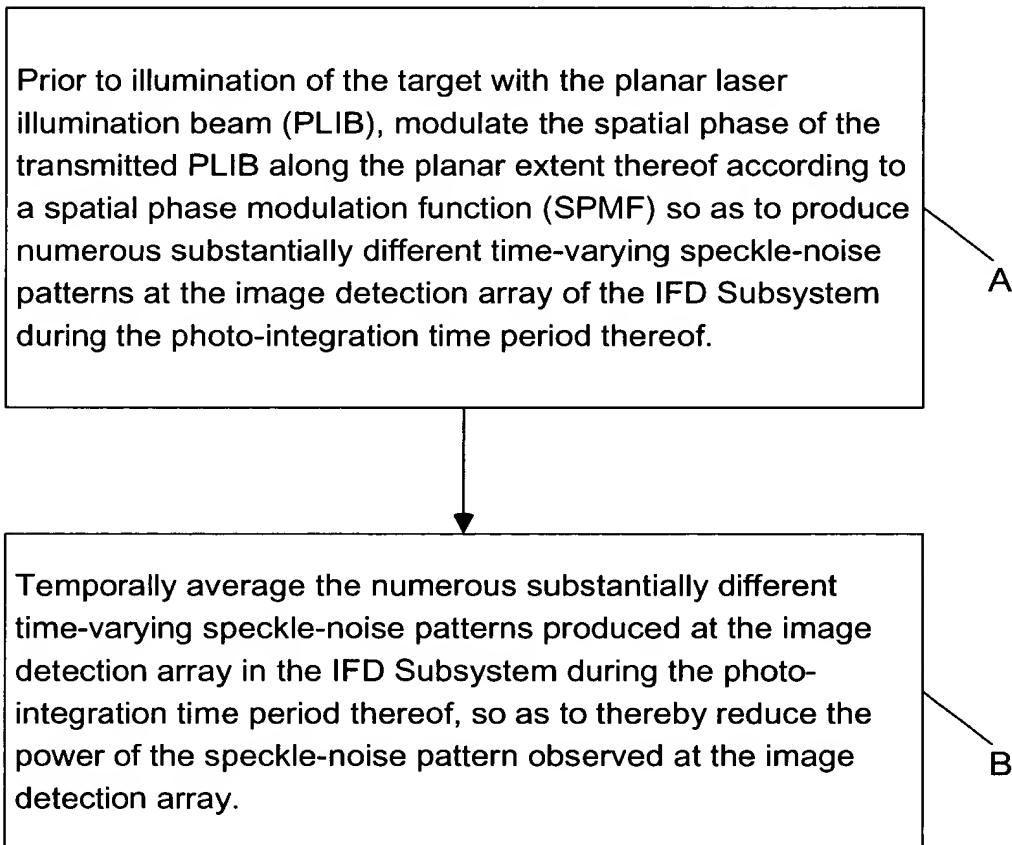
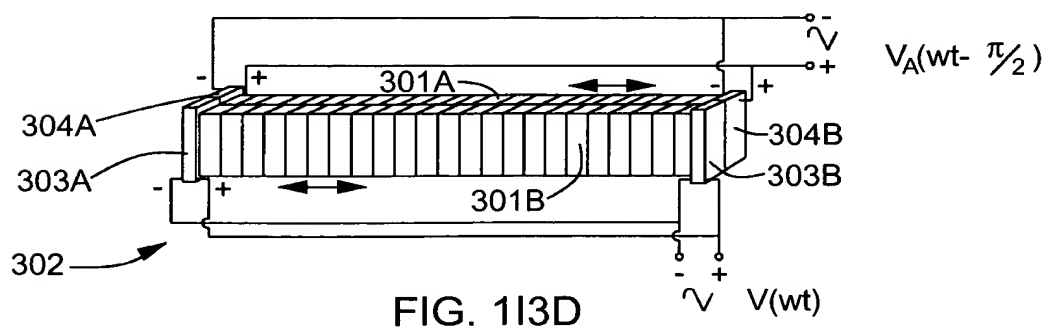
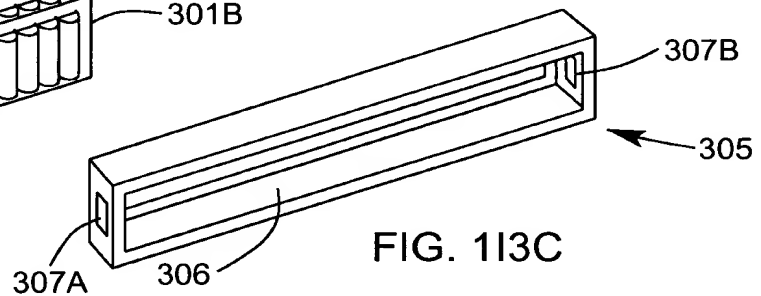
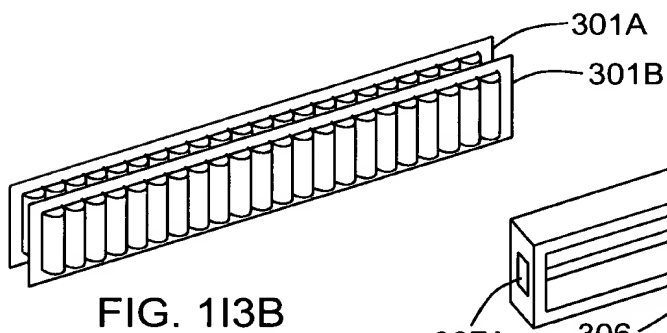
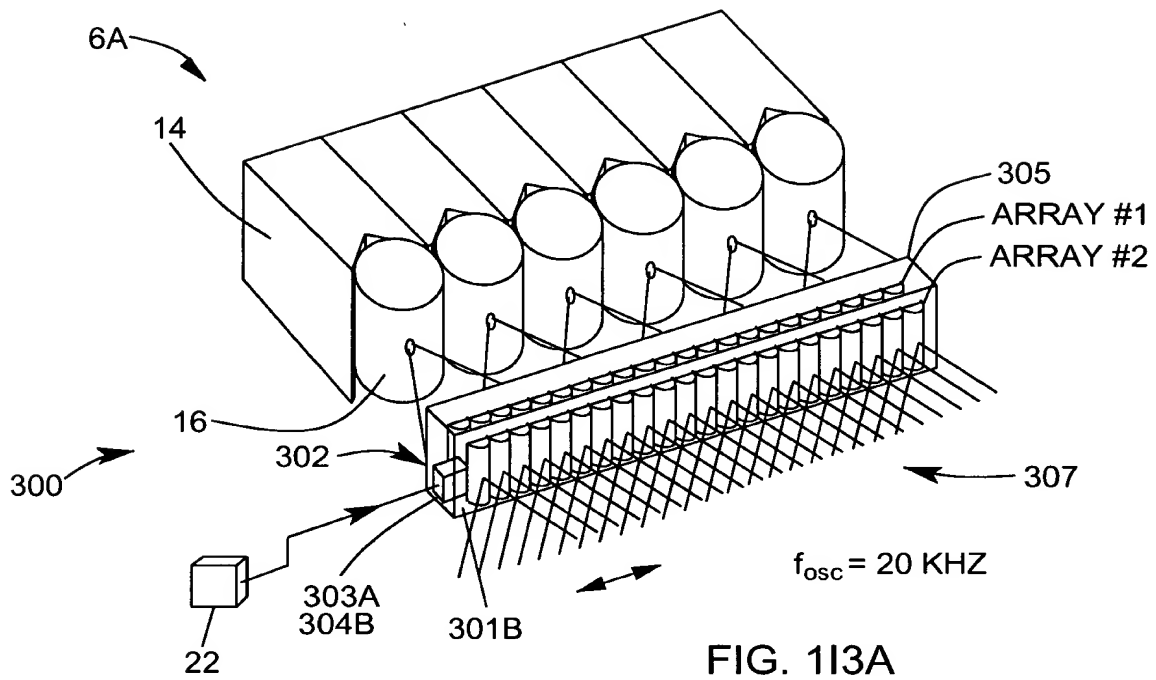
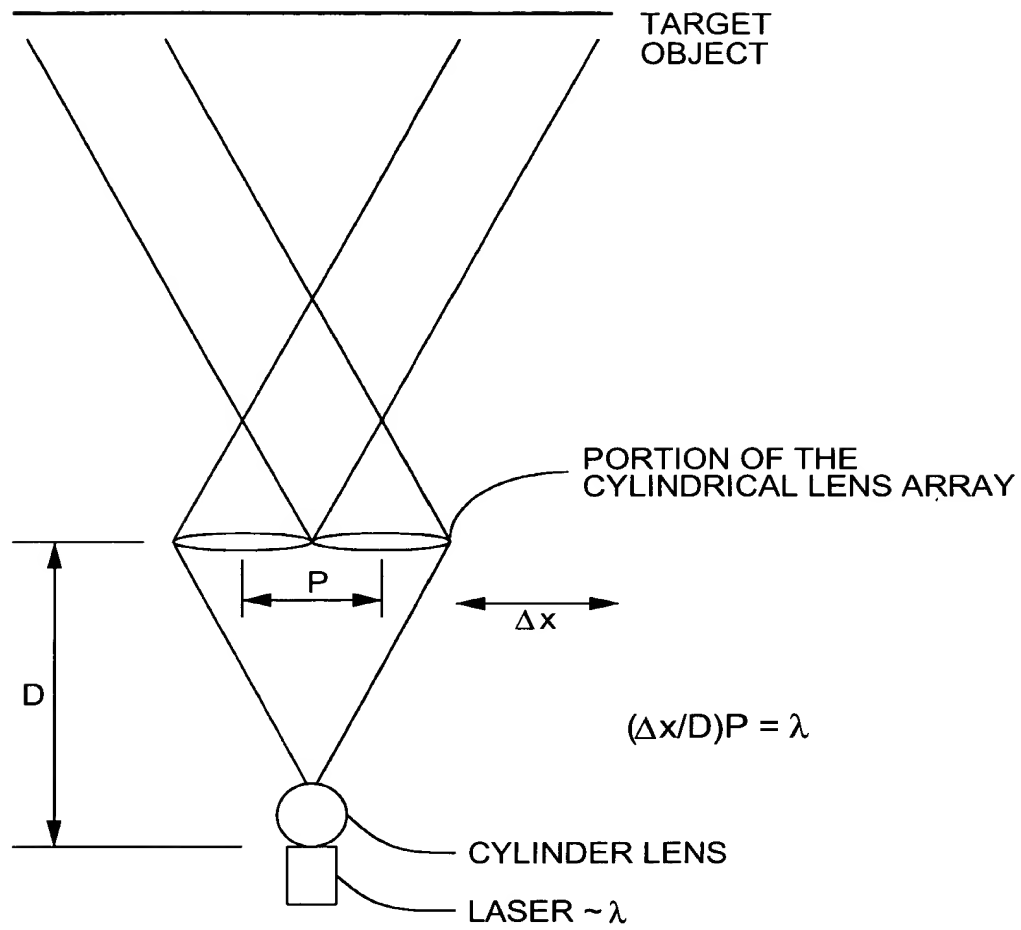


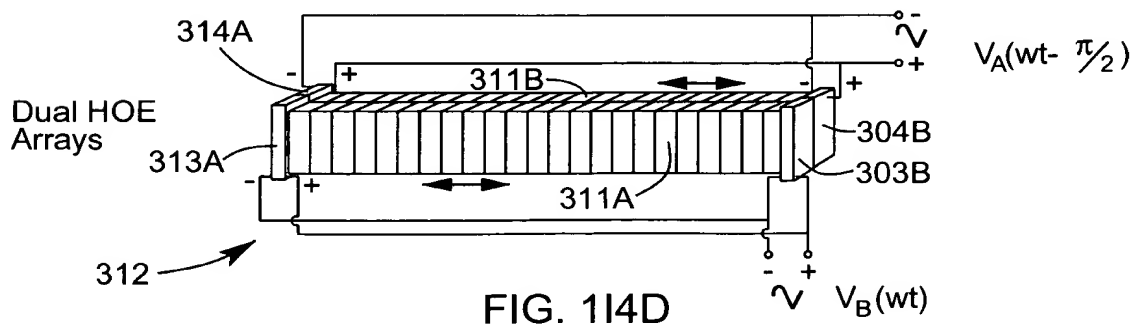
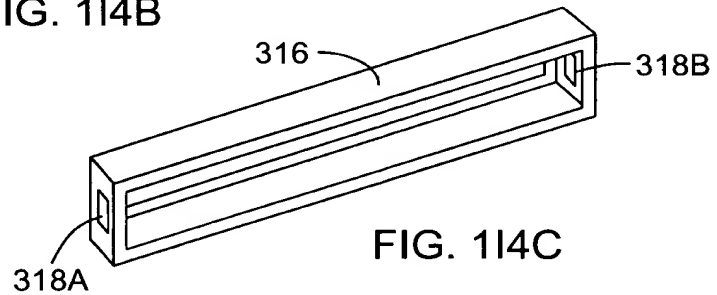
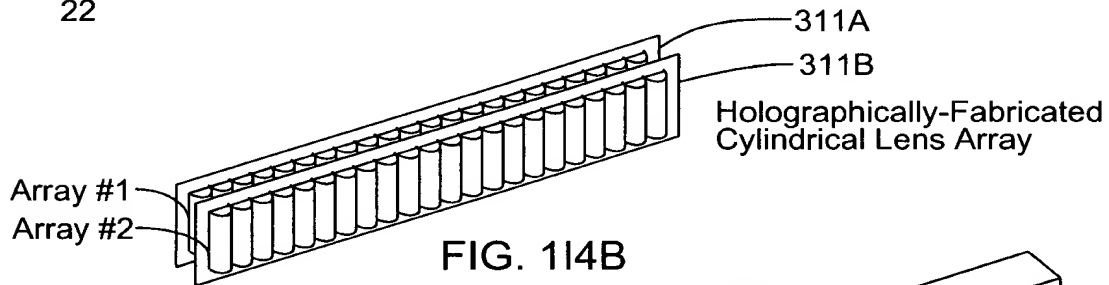
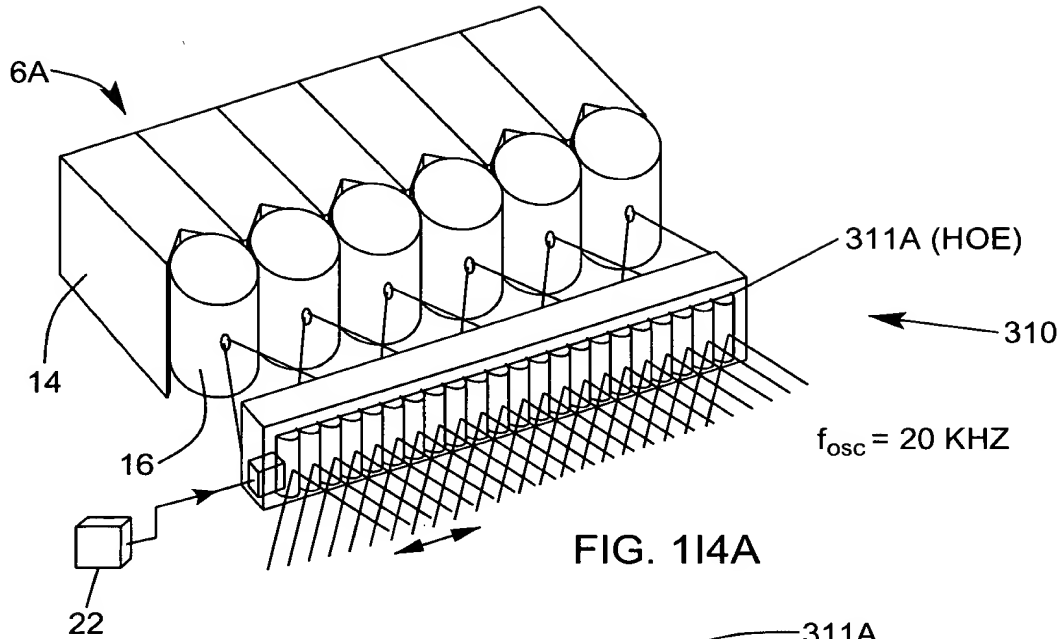
FIG. 112B

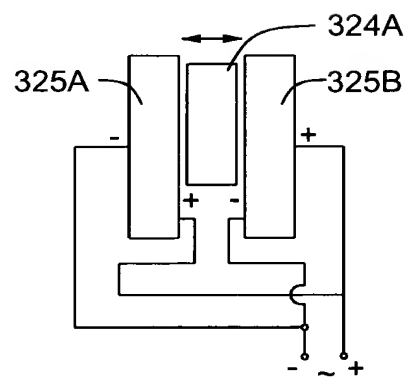




$$\Delta x \geq \frac{\lambda \cdot D}{P}$$

FIG. 113E





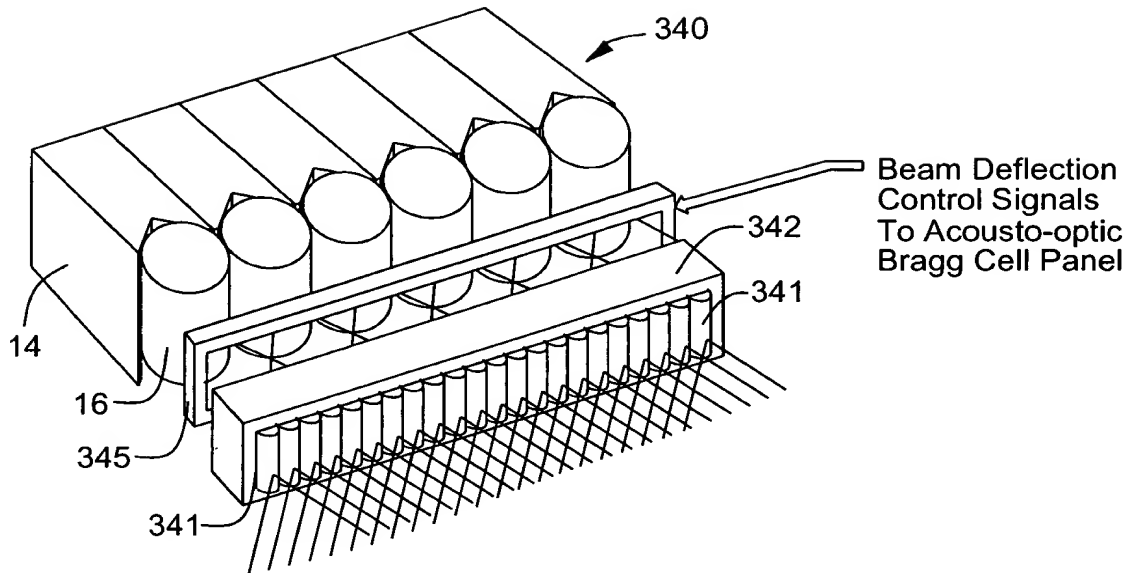


FIG. 116A

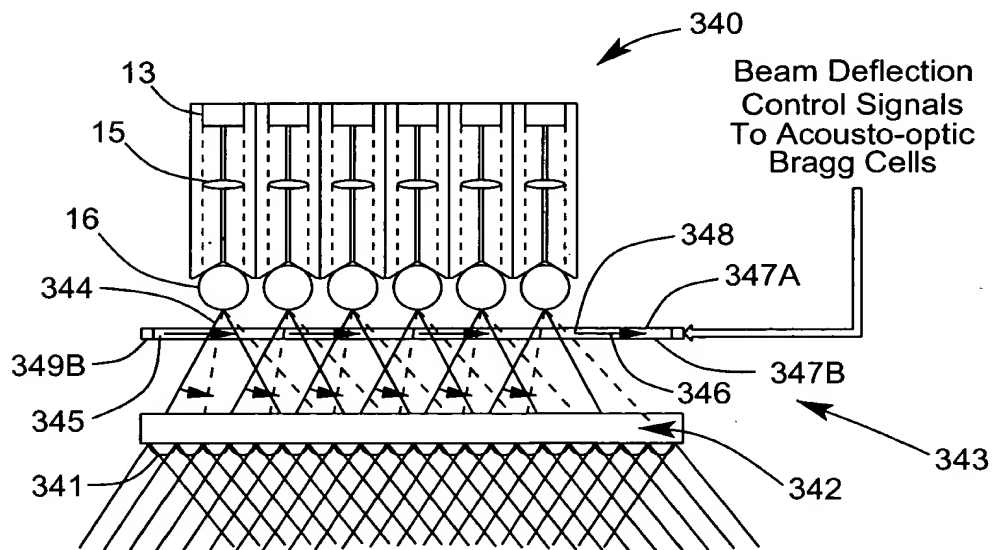
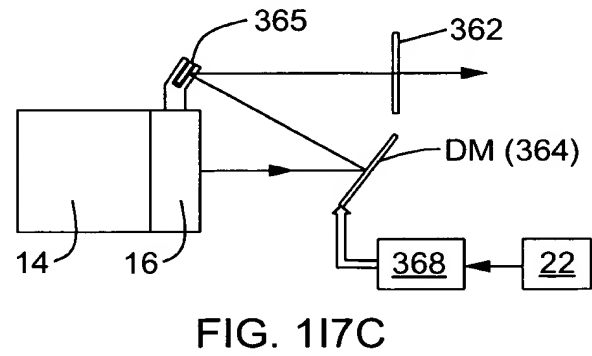
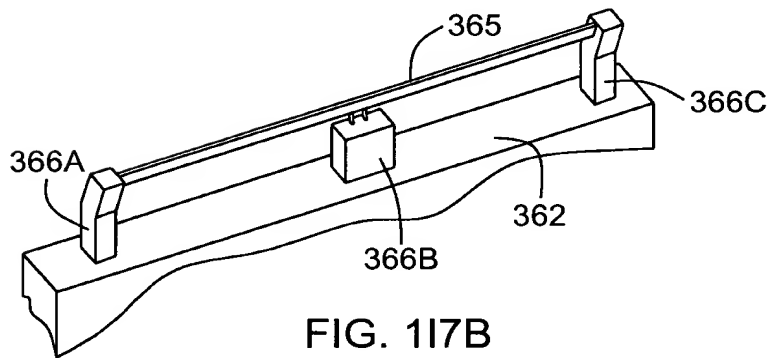
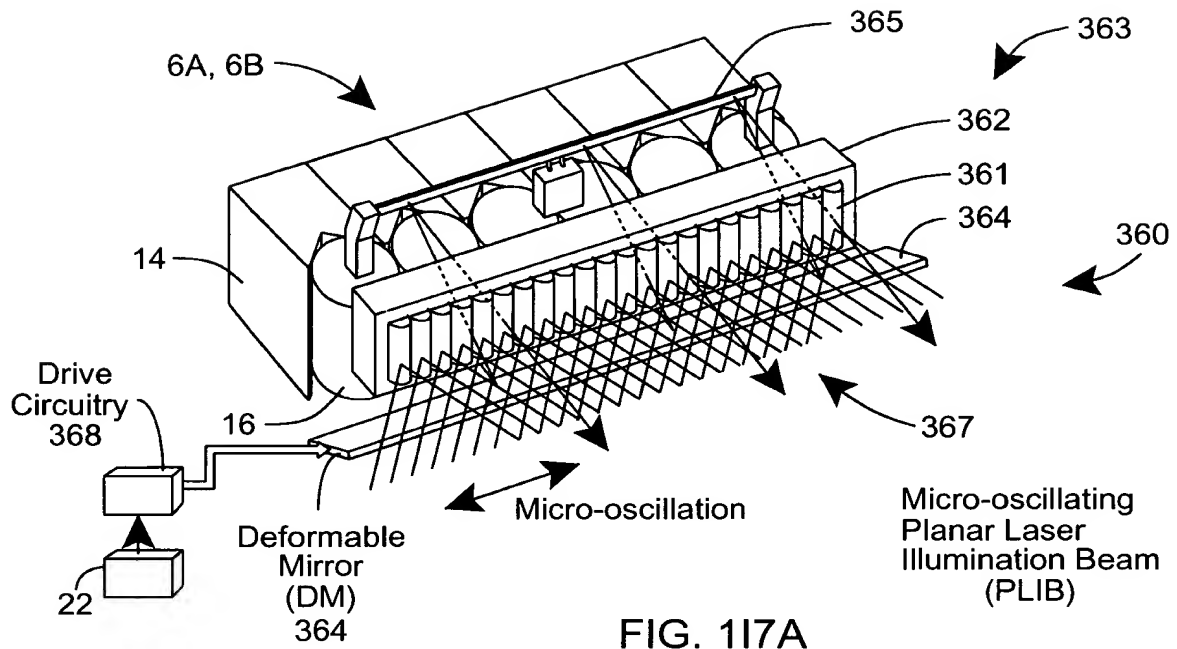


FIG. 116B





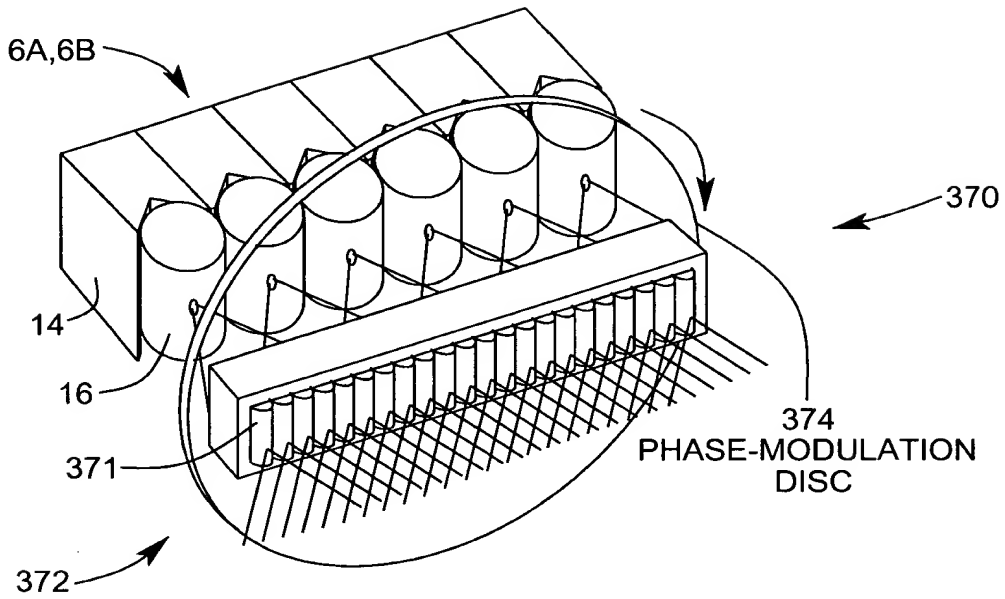


FIG. 118A

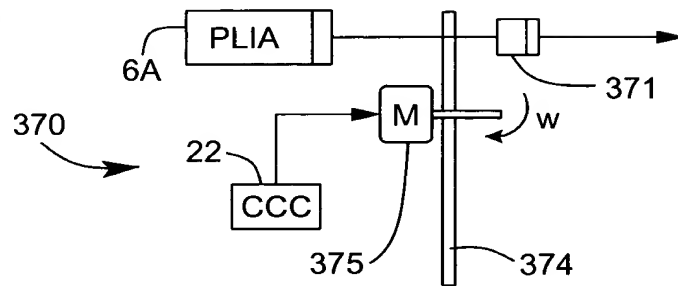


FIG. 118B

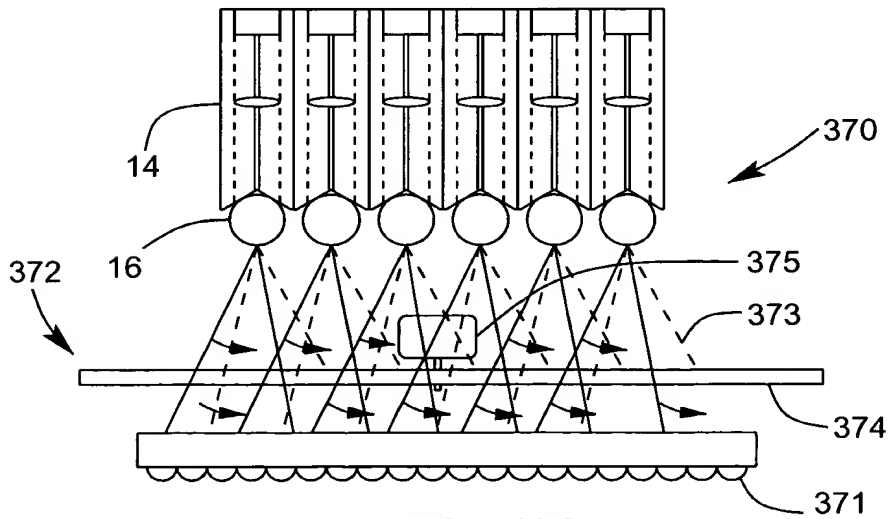


FIG. 118C

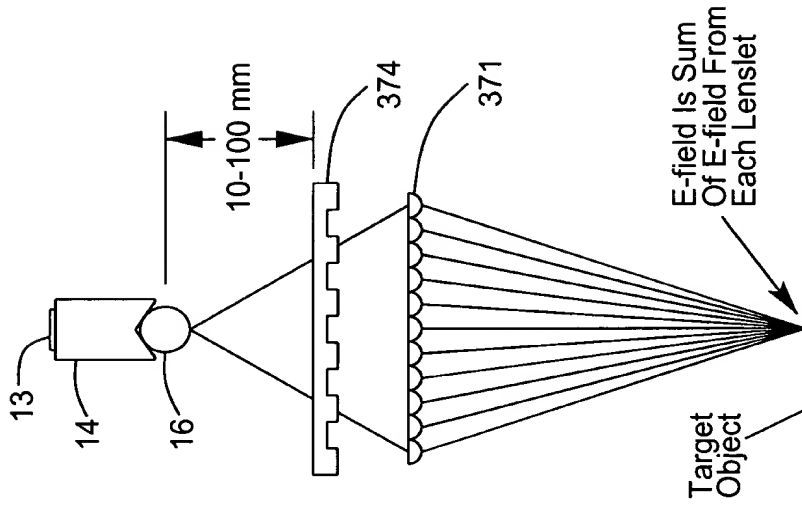


FIG. 118E

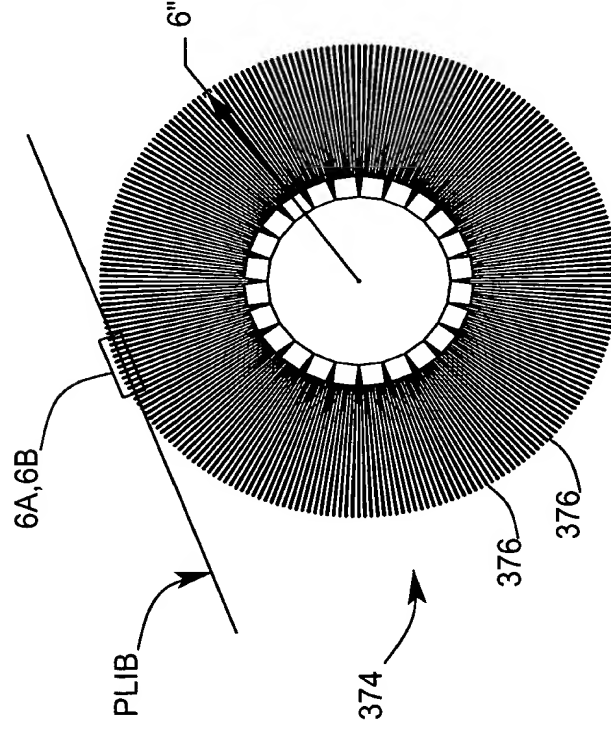
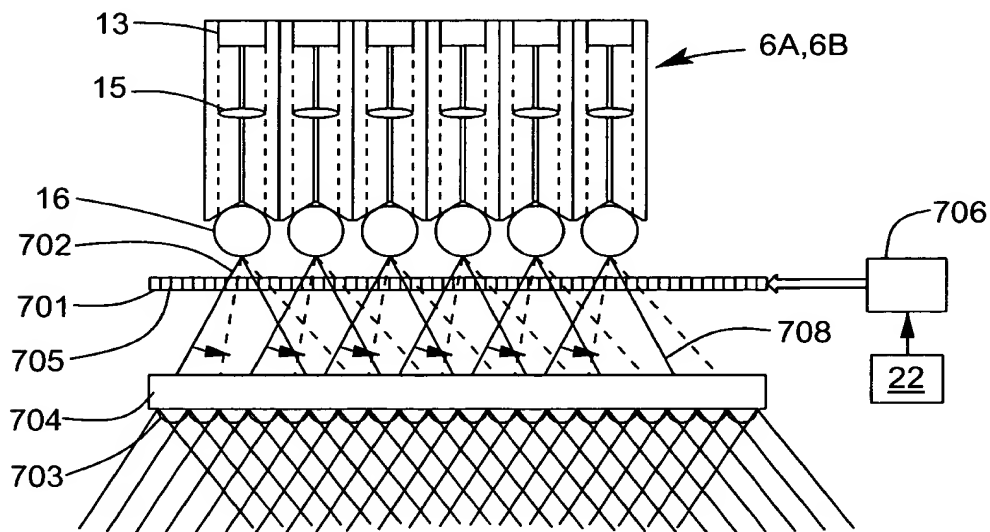
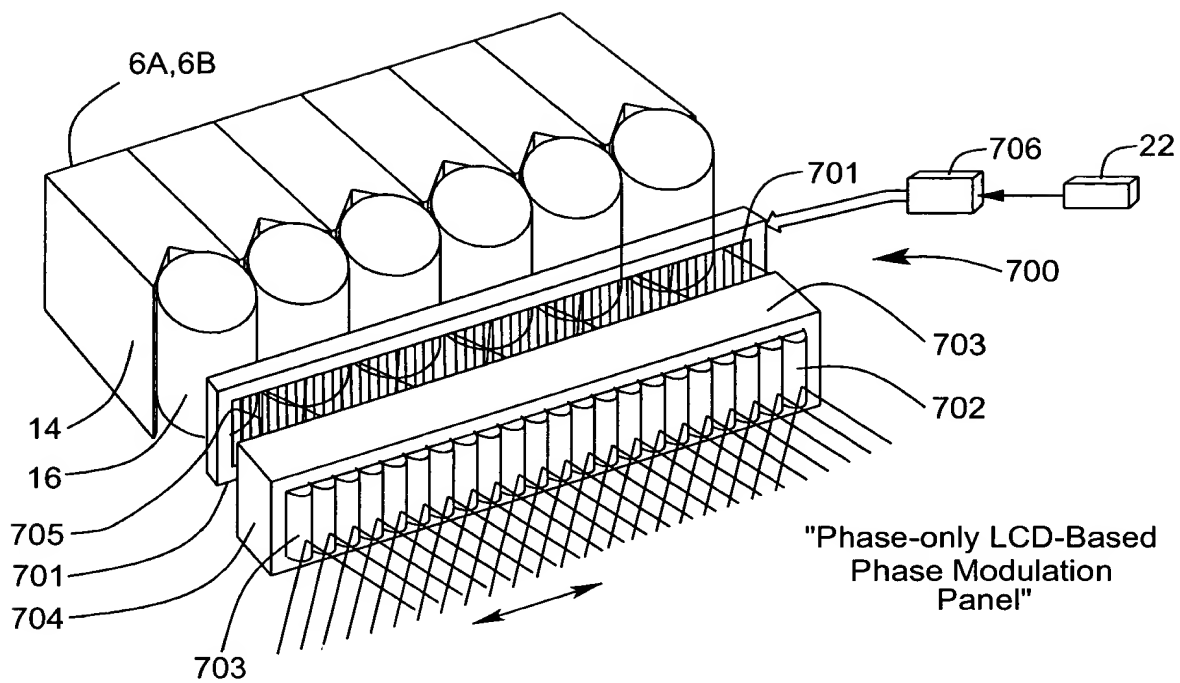


FIG. 118D



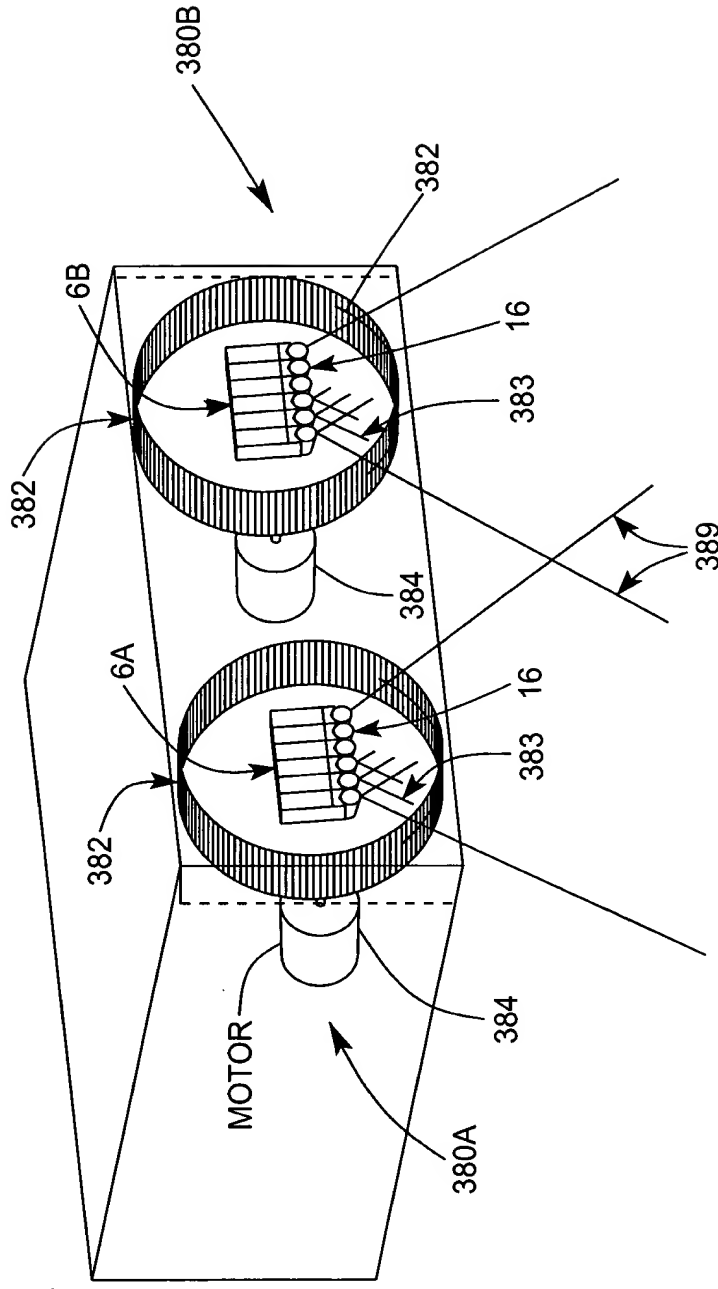


FIG. 119A

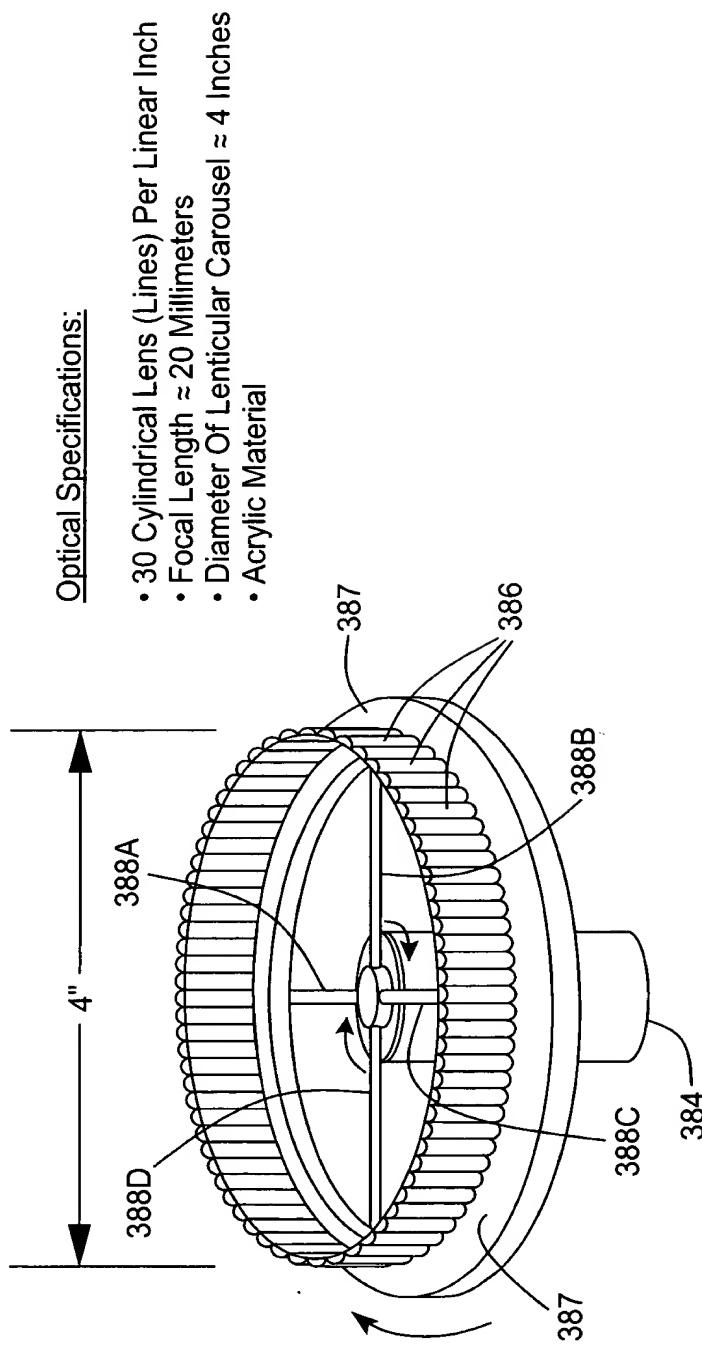


FIG. 119B

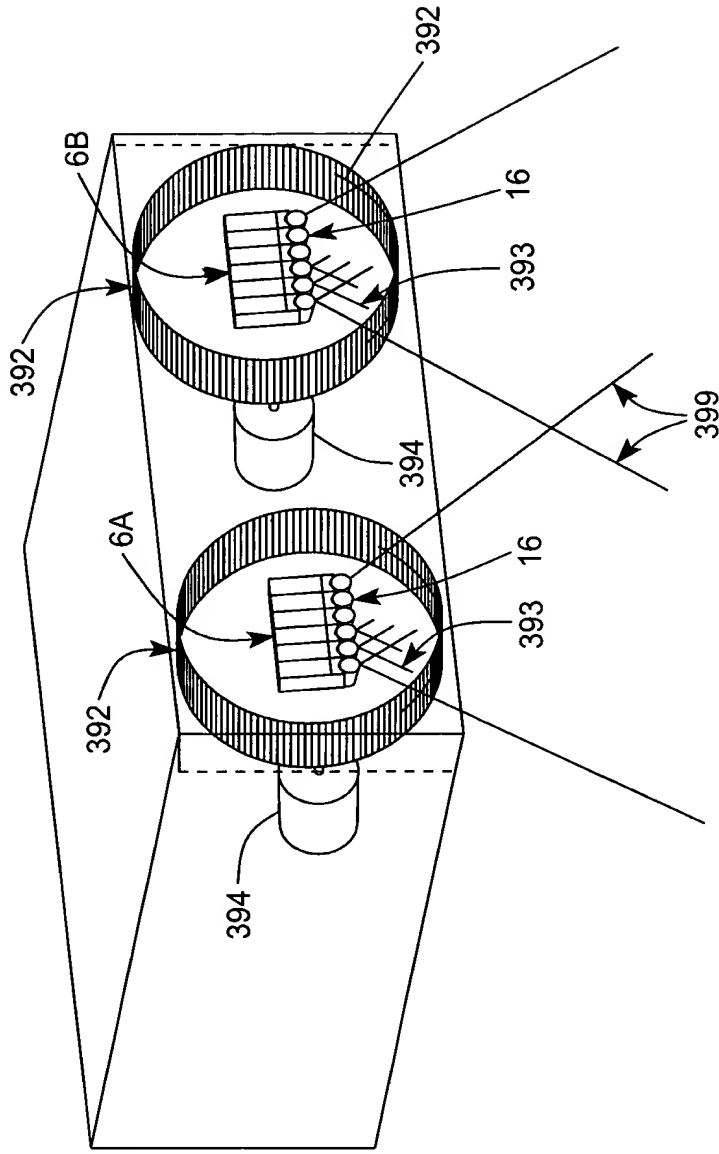
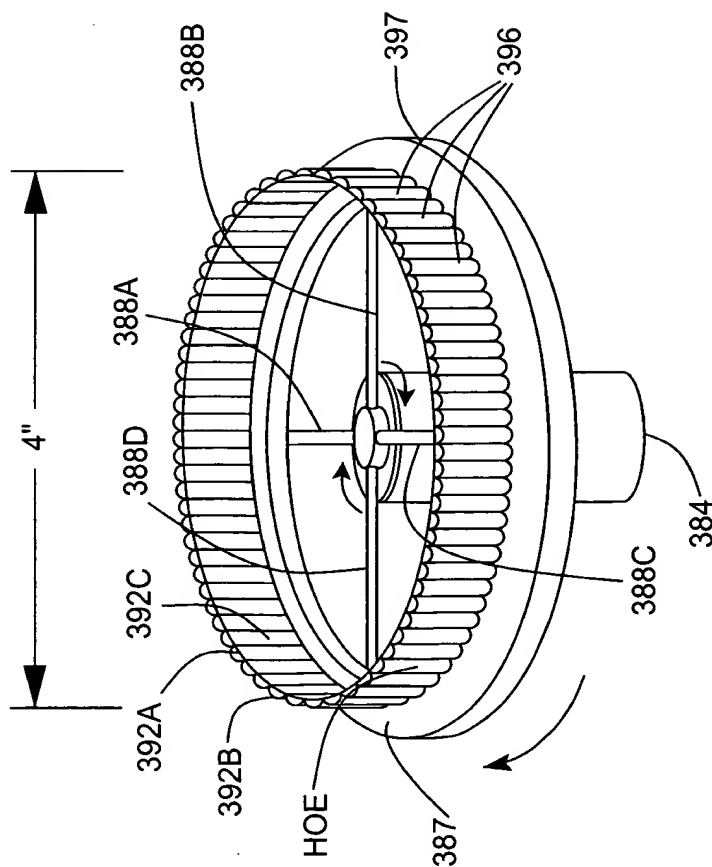


FIG. 1110A



### Optical Specifications:

- 30 Cylindrical Lens (Lines) Per Linear Inch
- Focal Length  $\approx 20$  Millimeters
- Diameter Of Lenticular Carousel  $\approx 4$  Inches

**FIG. 110B**



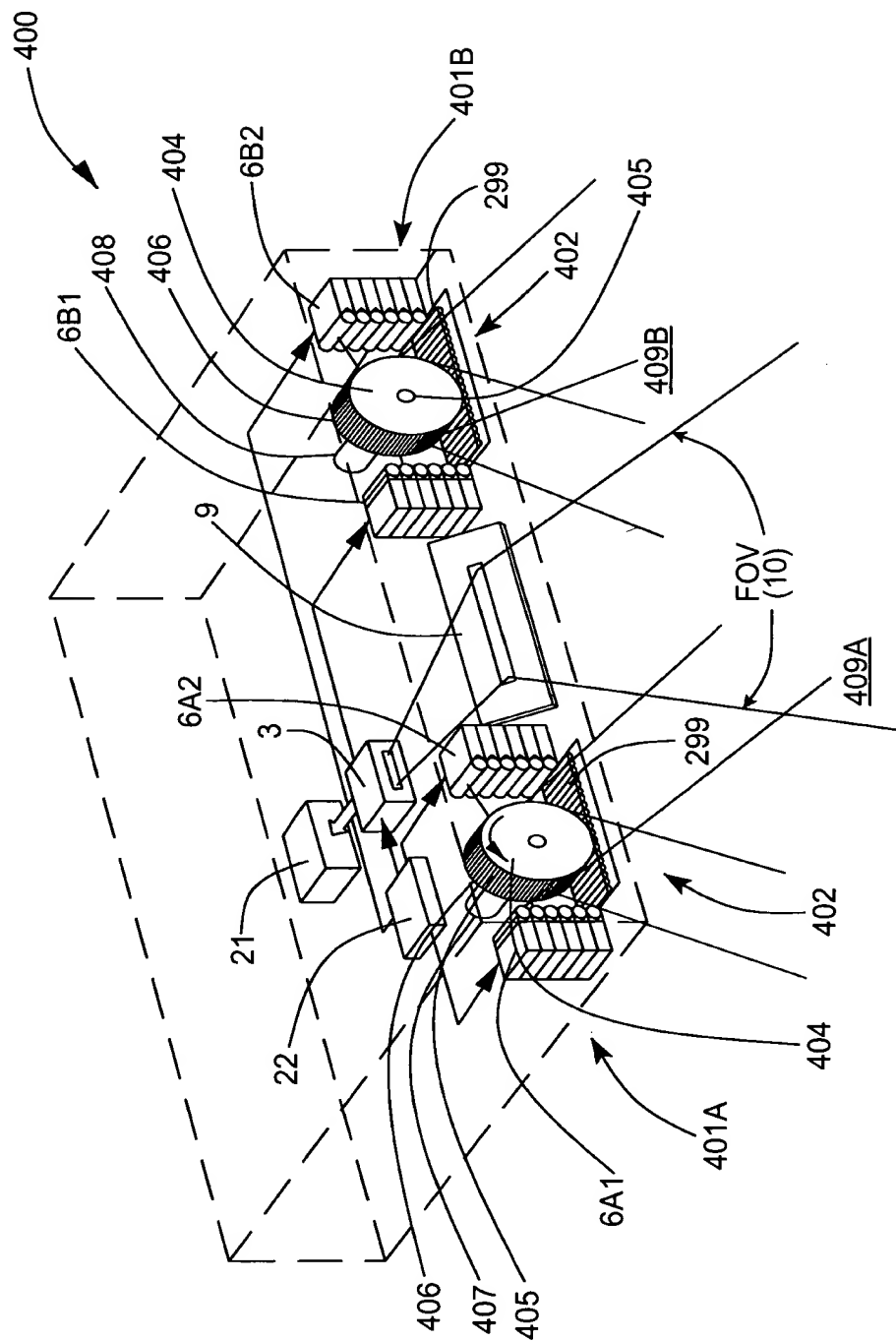


FIG. 1111A

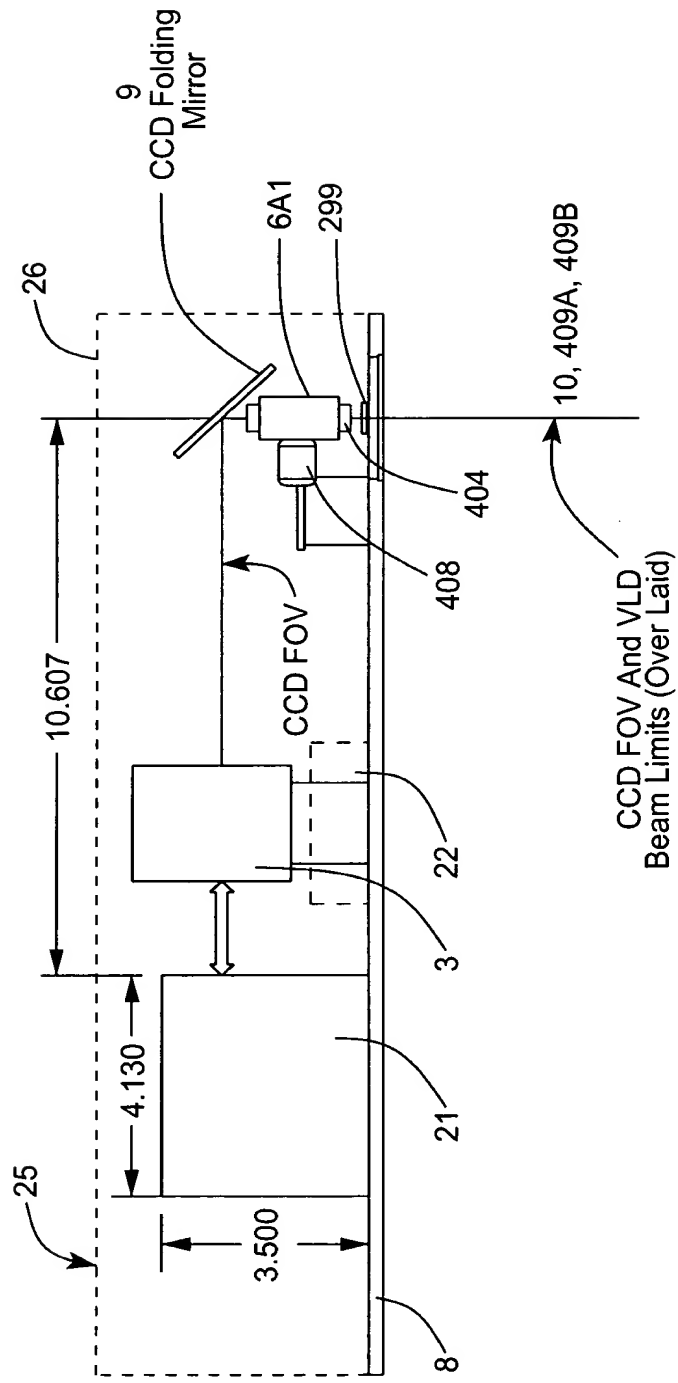


FIG. 1111B

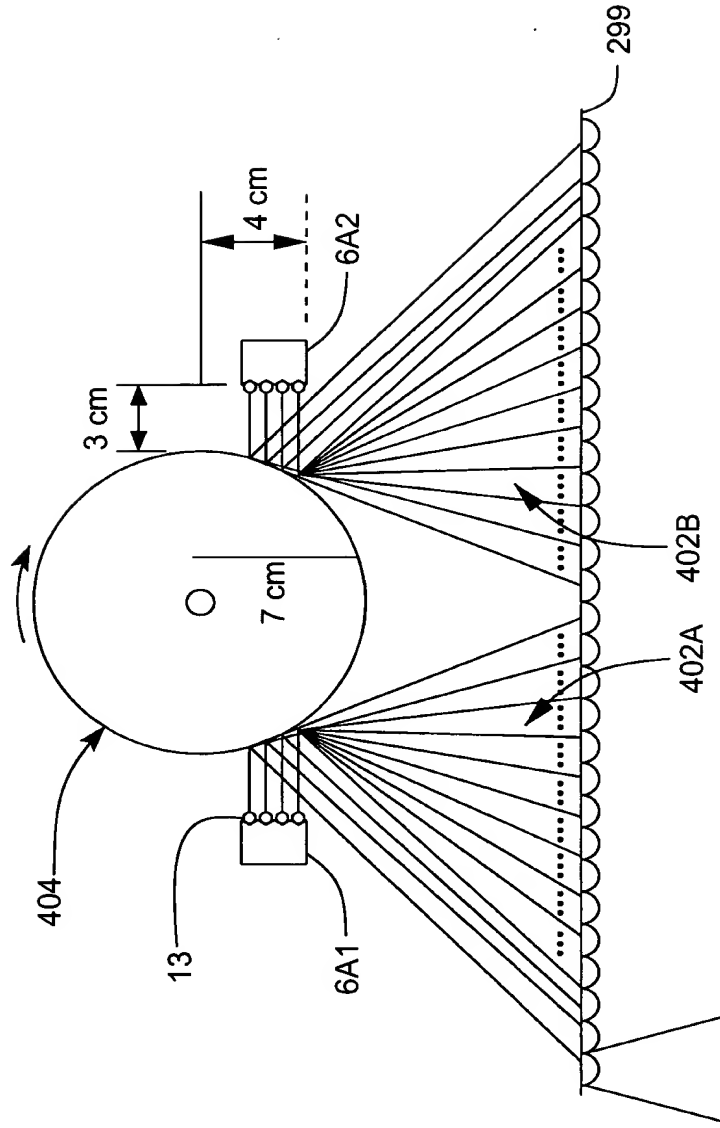


FIG. 1I11C

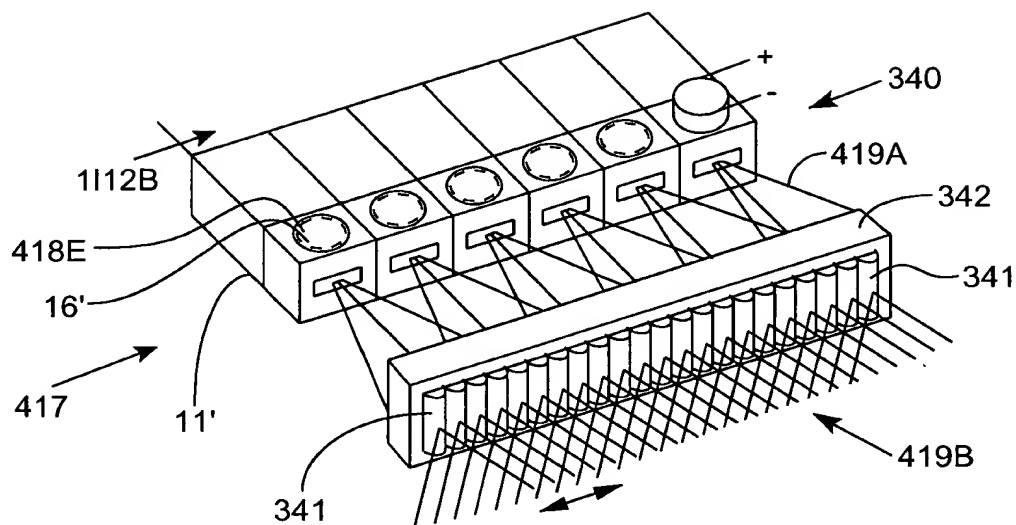


FIG. 1112A

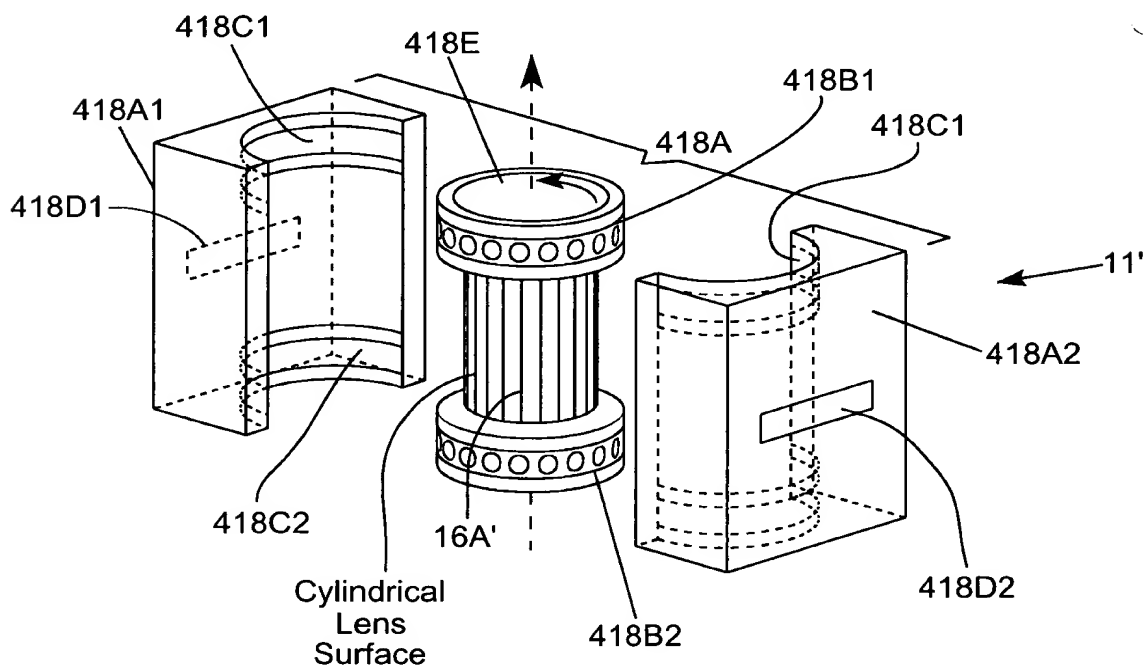


FIG. 1112B

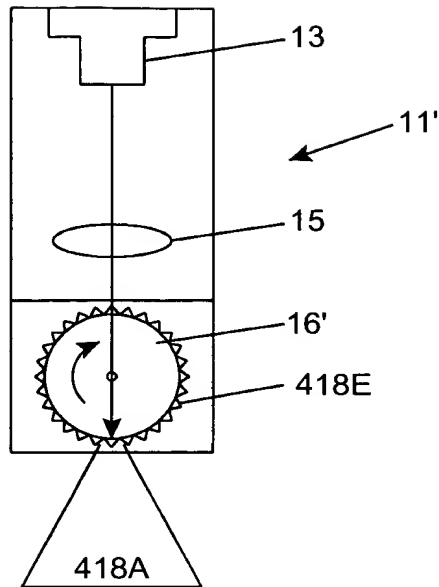


FIG. 1112C

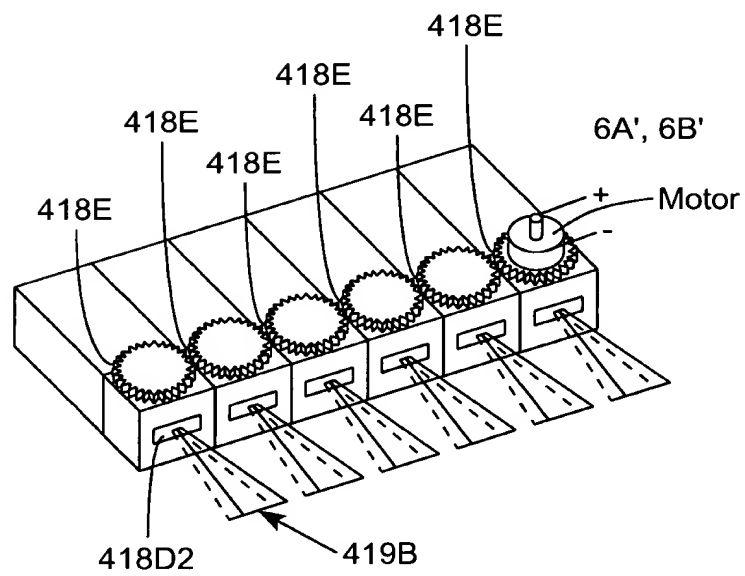


FIG. 1112D

Second Generalized Method Of  
Reducing Speckle-Noise Patterns  
At Image Detection Array  
Of The IFD Subsystem (3)

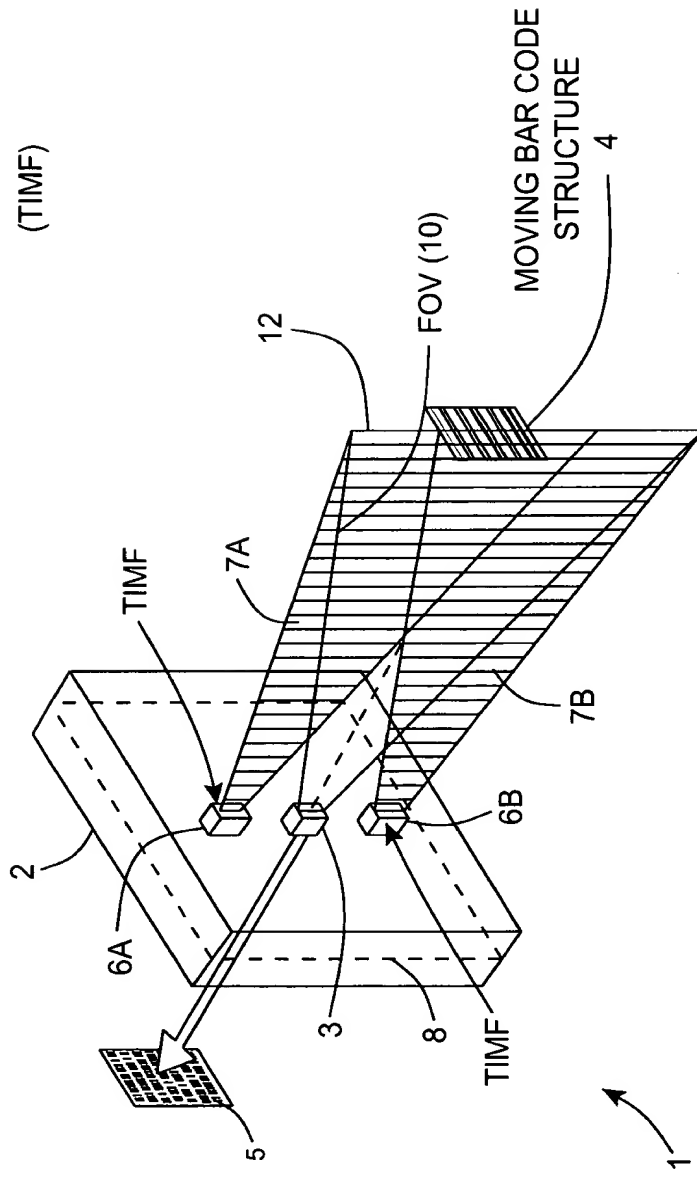


FIG. 1113

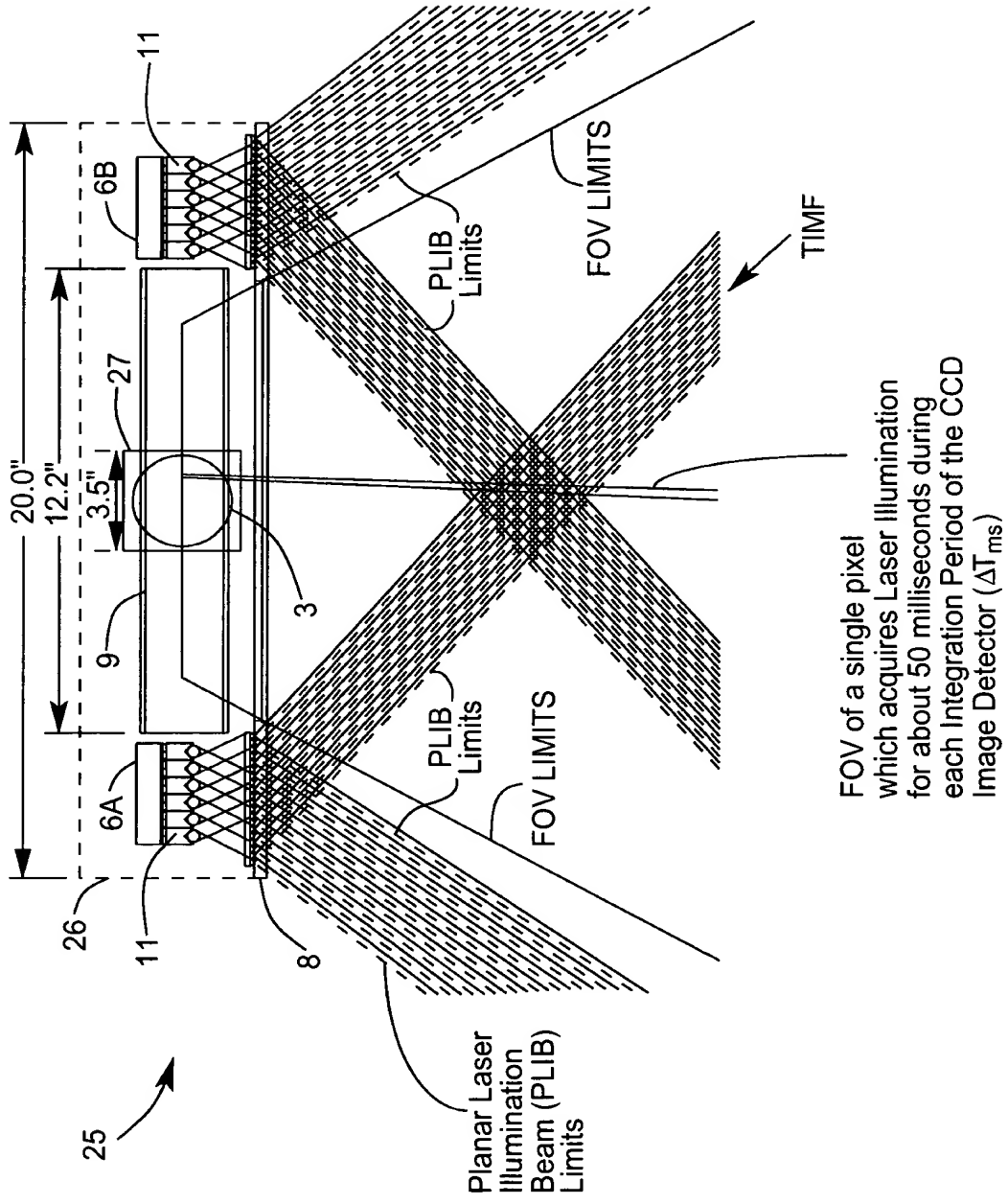
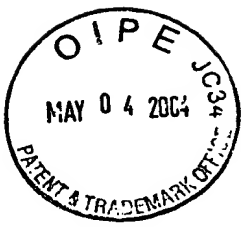


FIG. 1113A



THE SECOND GENERALIZED SPECKLE-NOISE PATTERN REDUCTION  
METHOD OF THE PRESENT INVENTION

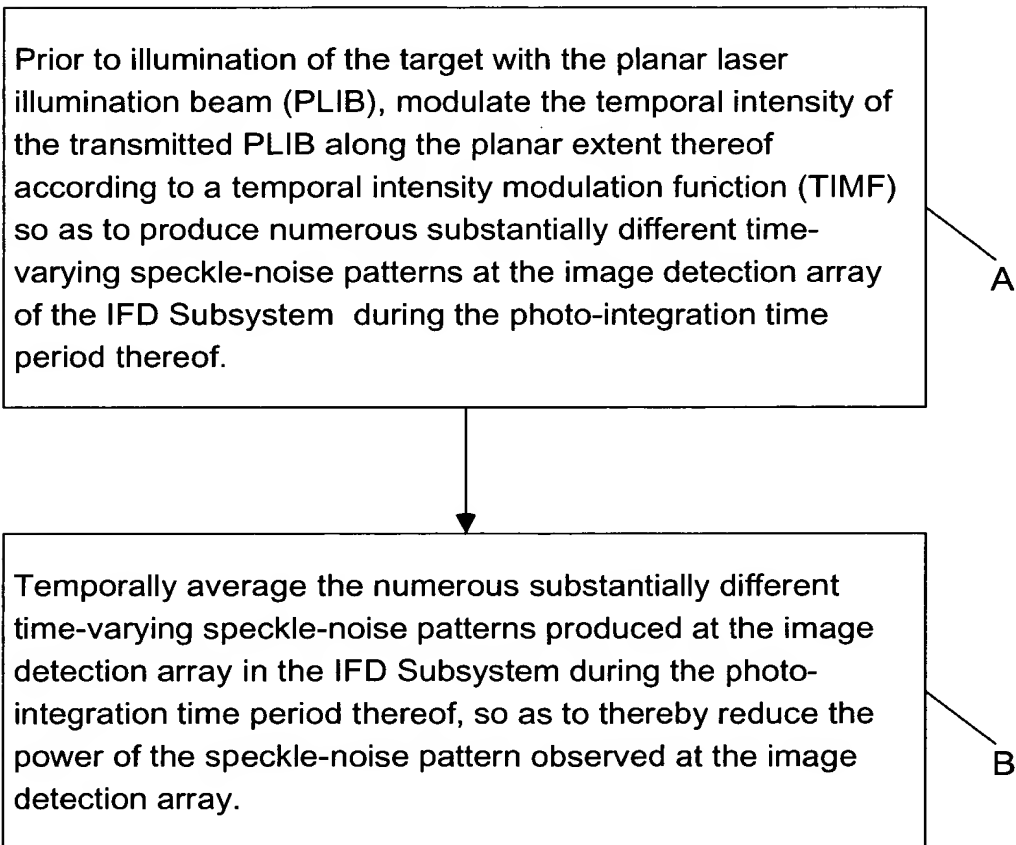


FIG. 1113B



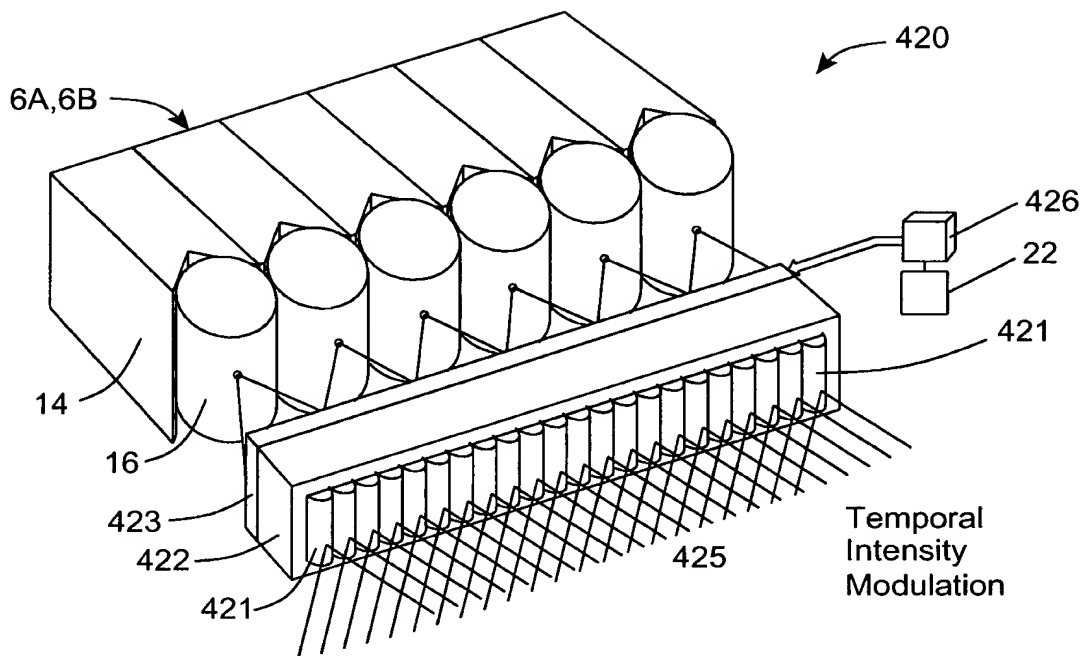


FIG. 1114A

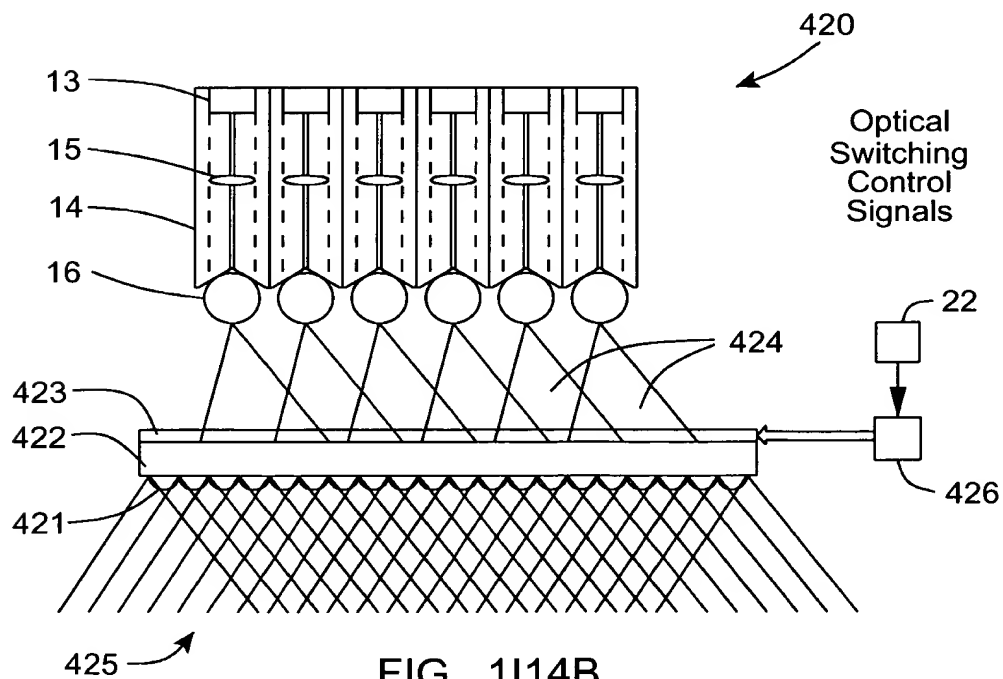


FIG. 1114B

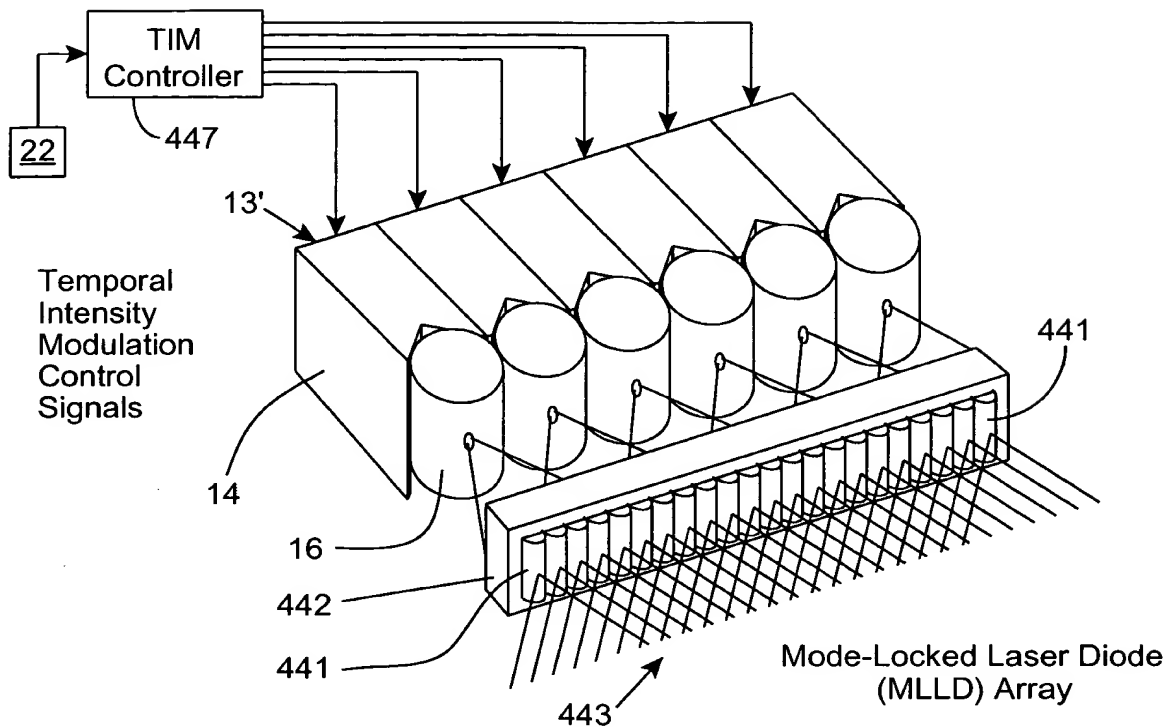


FIG. 1115A

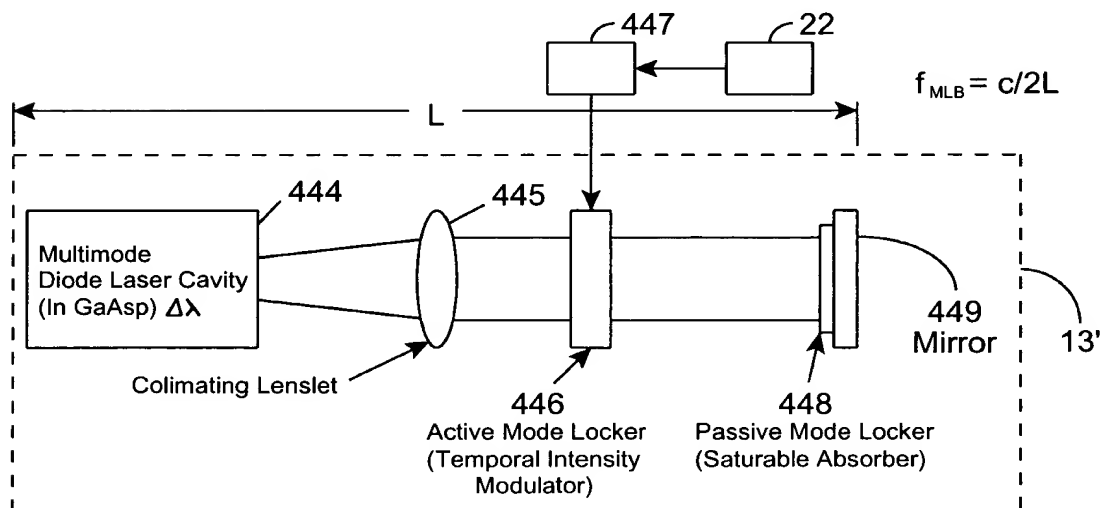


FIG. 1115B



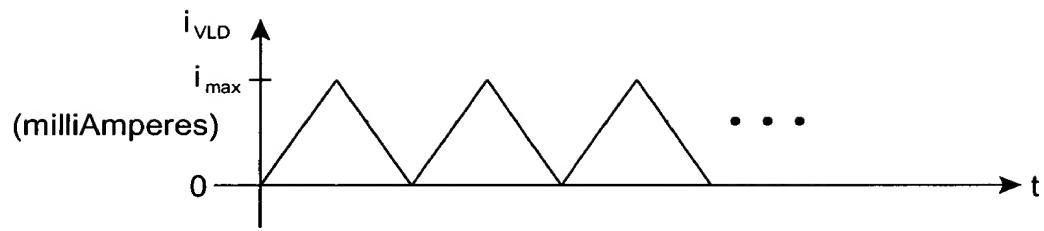


FIG. 1115E

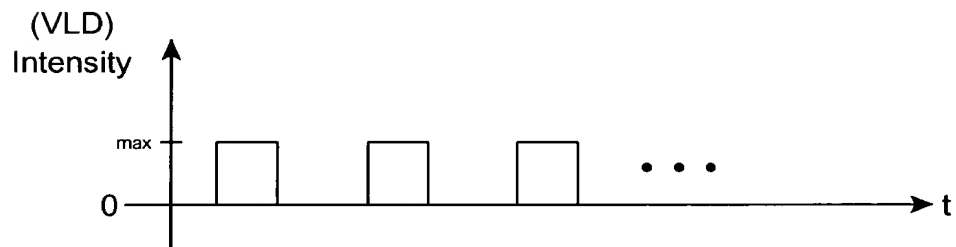


FIG. 1115F



Third Generalized Method Of  
Reducing Speckle-Noise Patterns  
At Image Detection Array  
Of The IFD Subsystem (3)

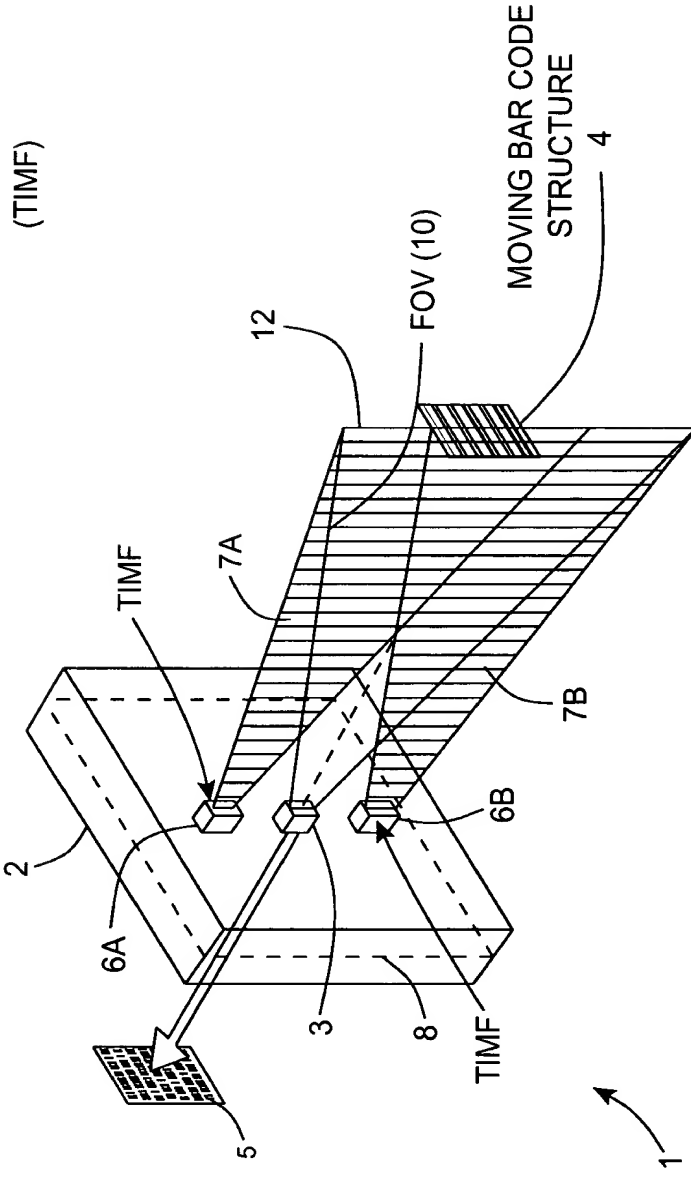


FIG. 1116

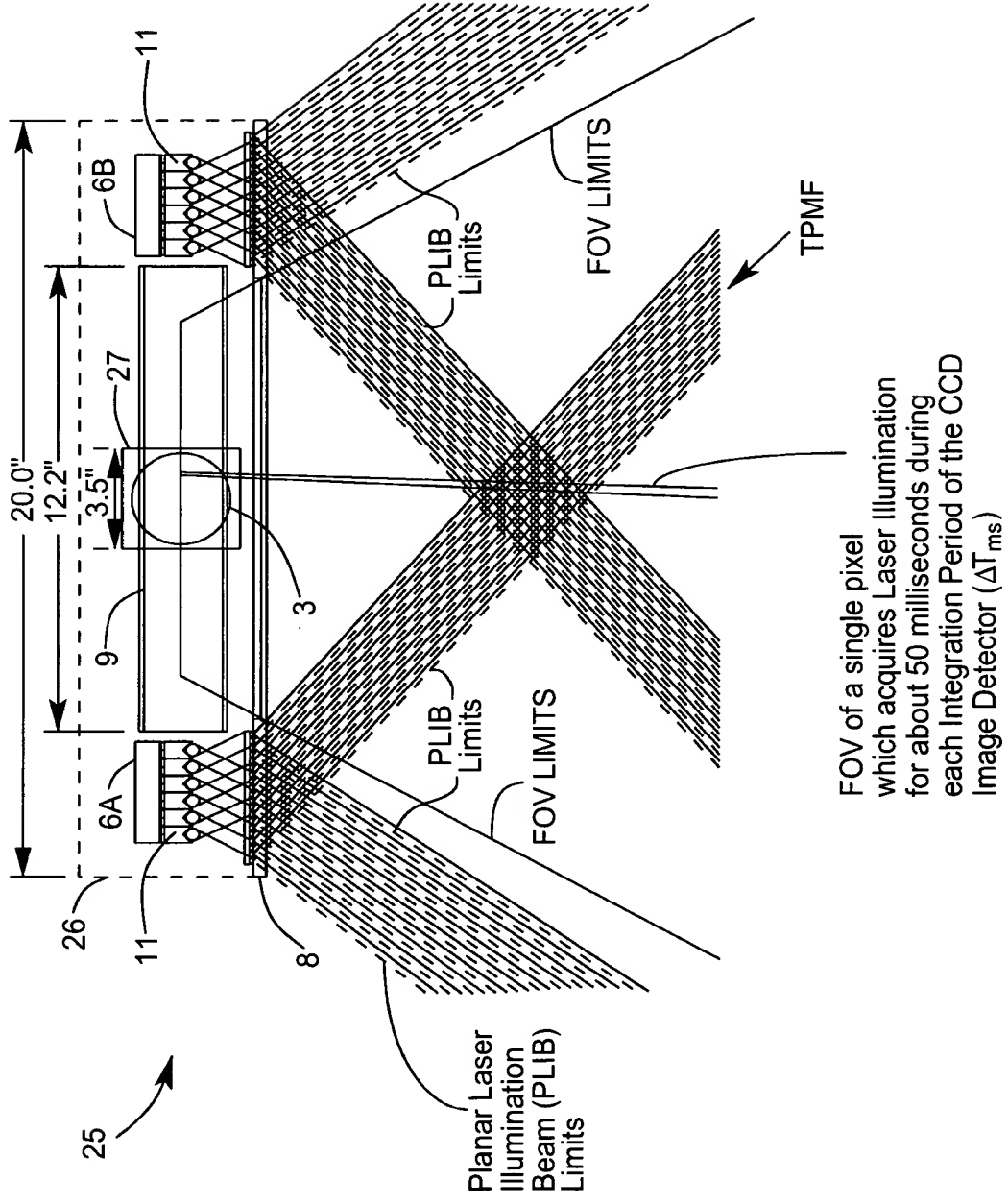


FIG. 1116A



THE THIRD GENERALIZED SPECKLE-NOISE PATTERN REDUCTION  
METHOD OF THE PRESENT INVENTION

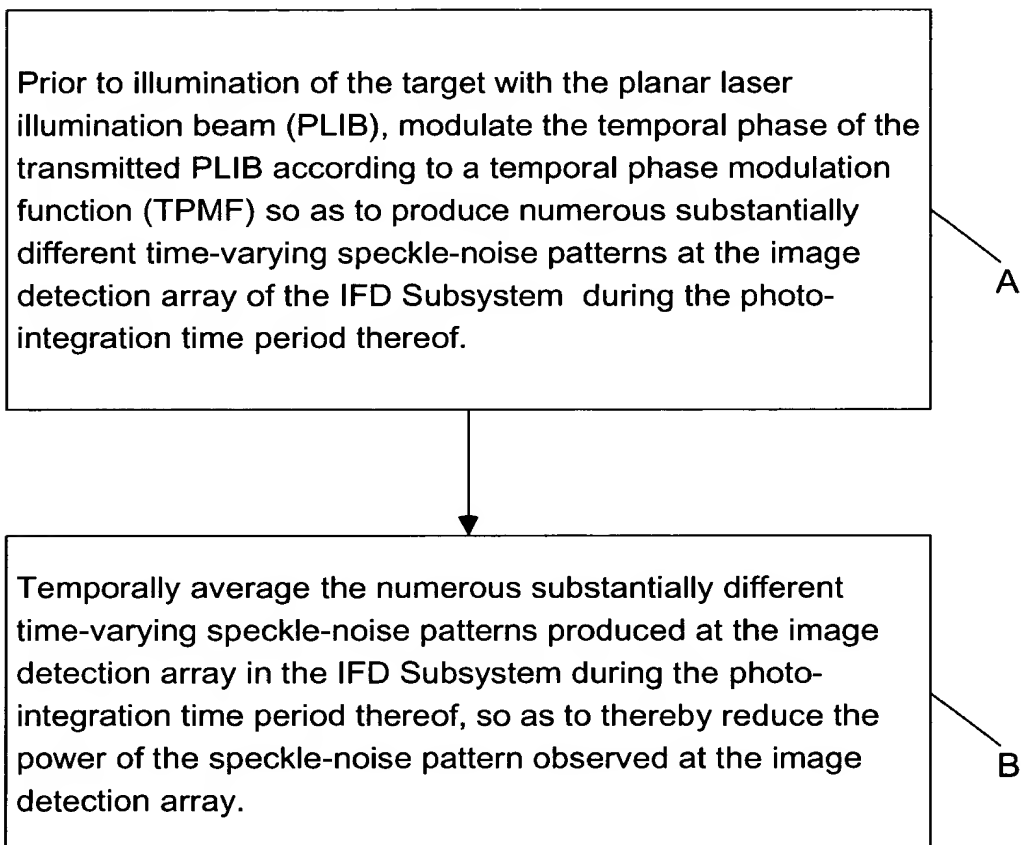


FIG. 1116B

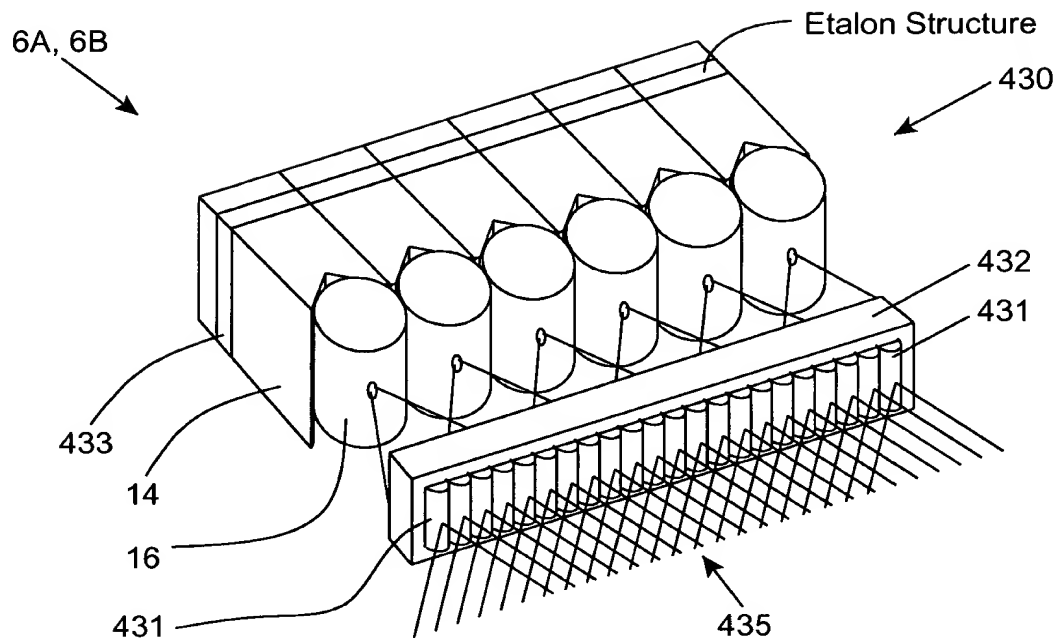


FIG. 1117A

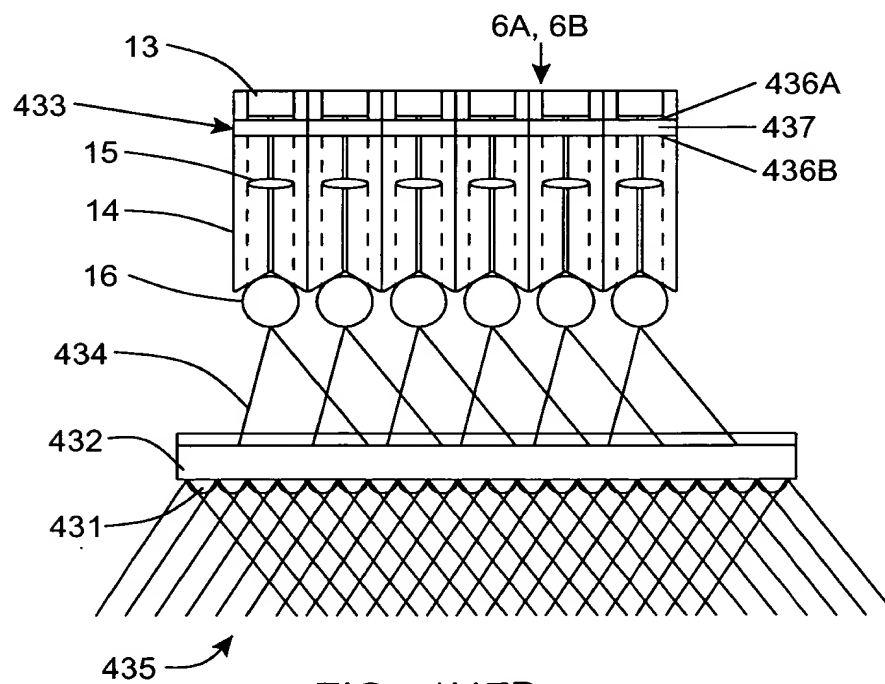


FIG. 1117B



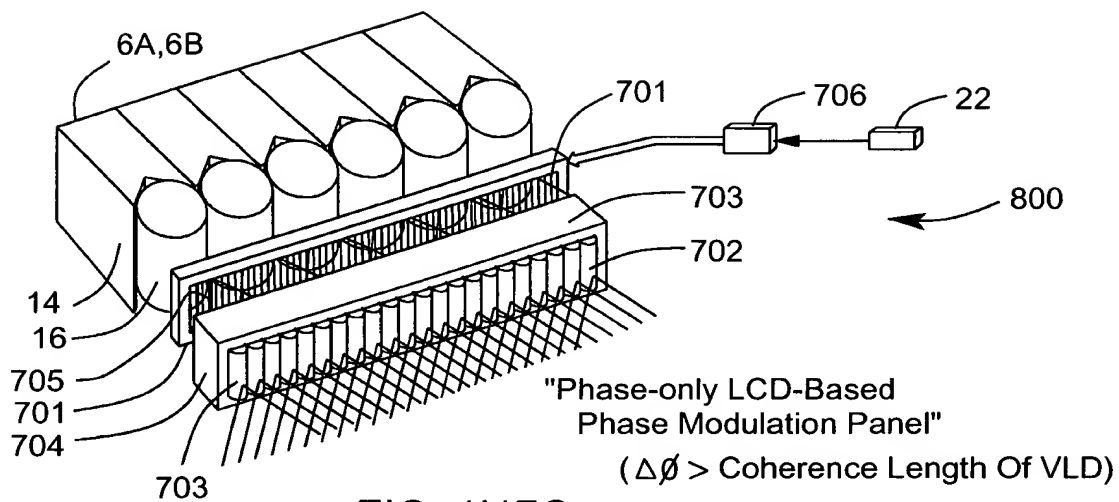


FIG. 1I17C

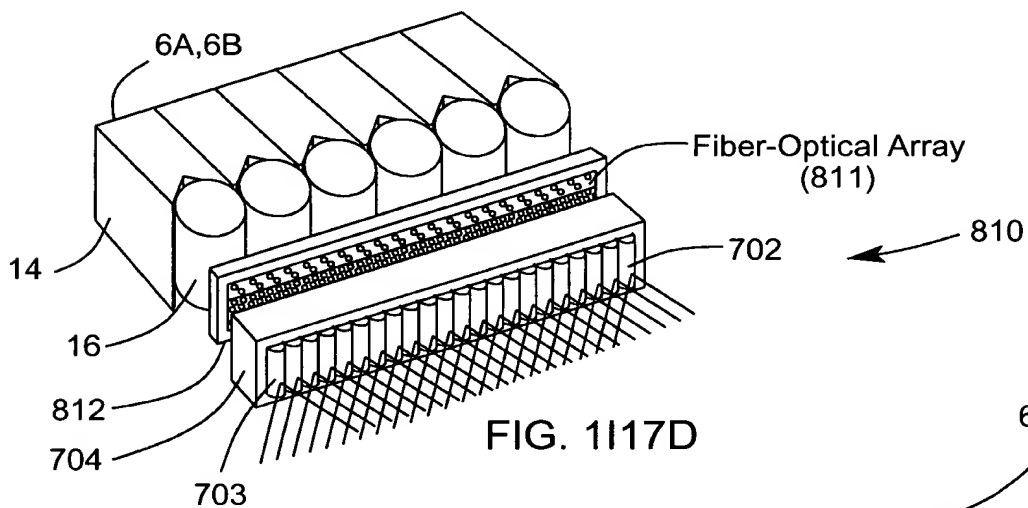


FIG. 1I17D

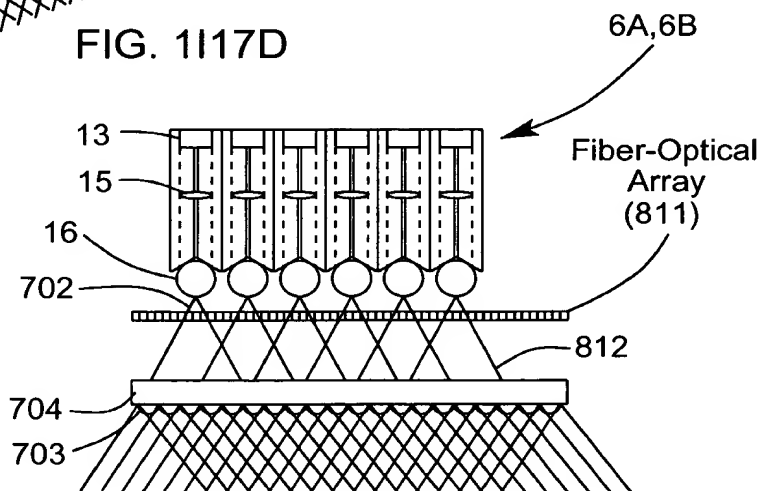


FIG. 1I17E

Fourth Generalized Method Of  
Reducing Speckle-Noise Patterns  
At Image Detection Array  
Of The IFD Subsystem (3)

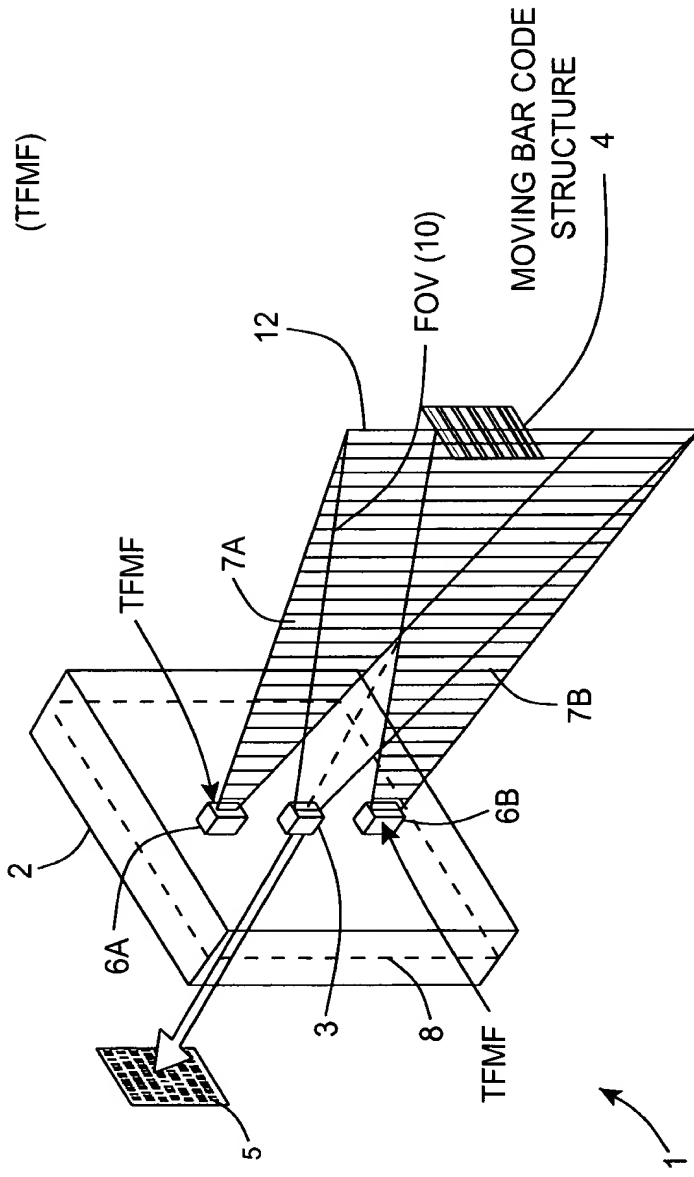


FIG. 1118

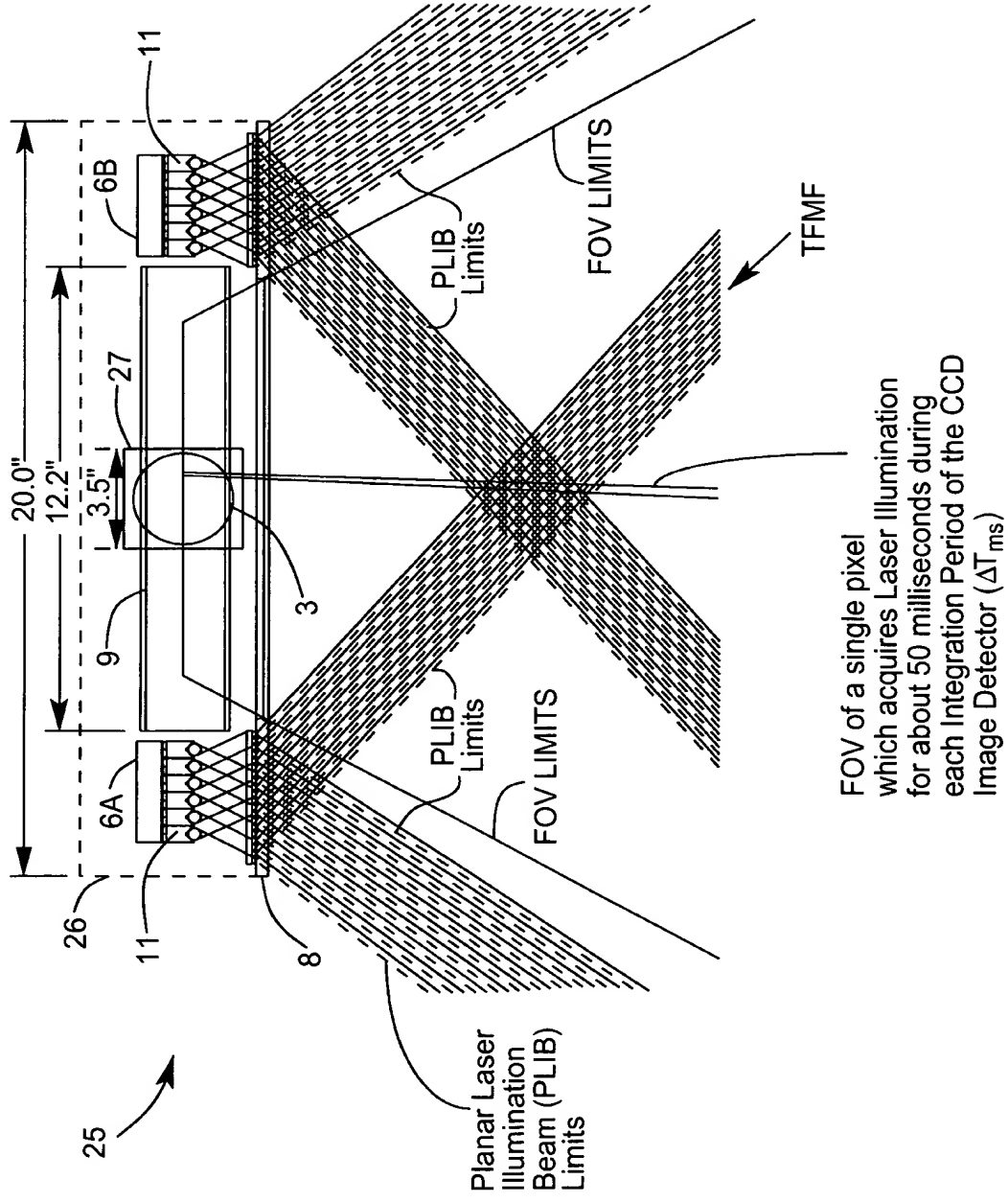


FIG. 1118A



THE FOURTH GENERALIZED SPECKLE-NOISE PATTERN REDUCTION  
METHOD OF THE PRESENT INVENTION

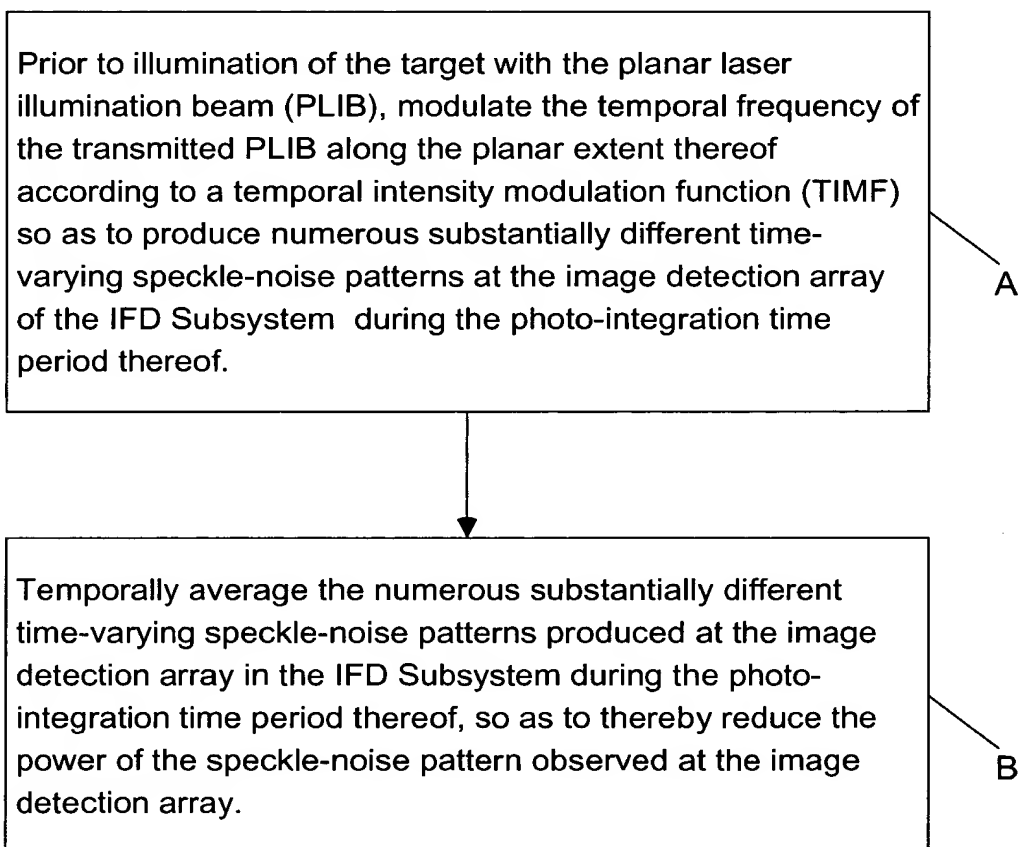


FIG. 1118B

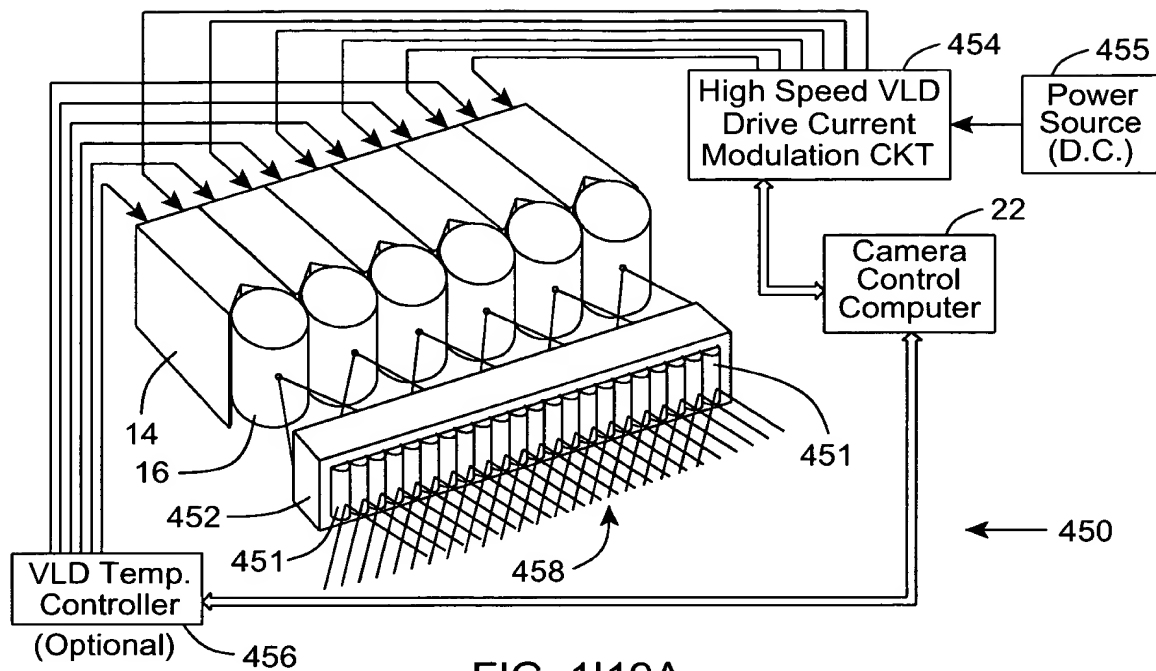


FIG. 1119A

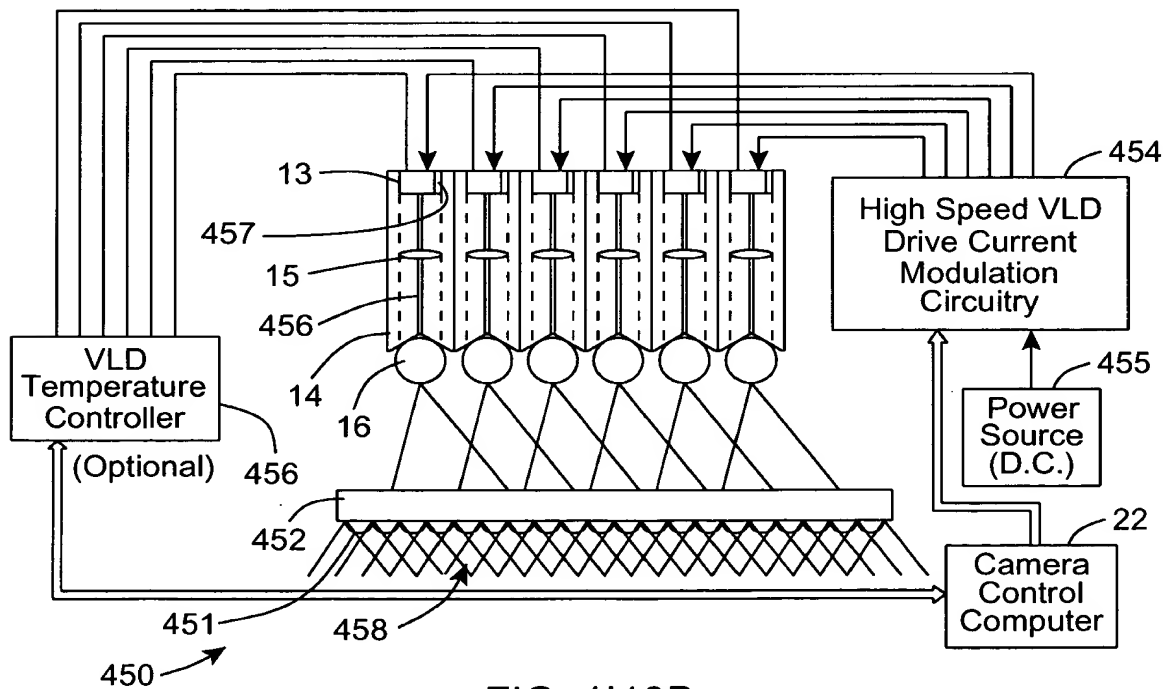


FIG. 1119B

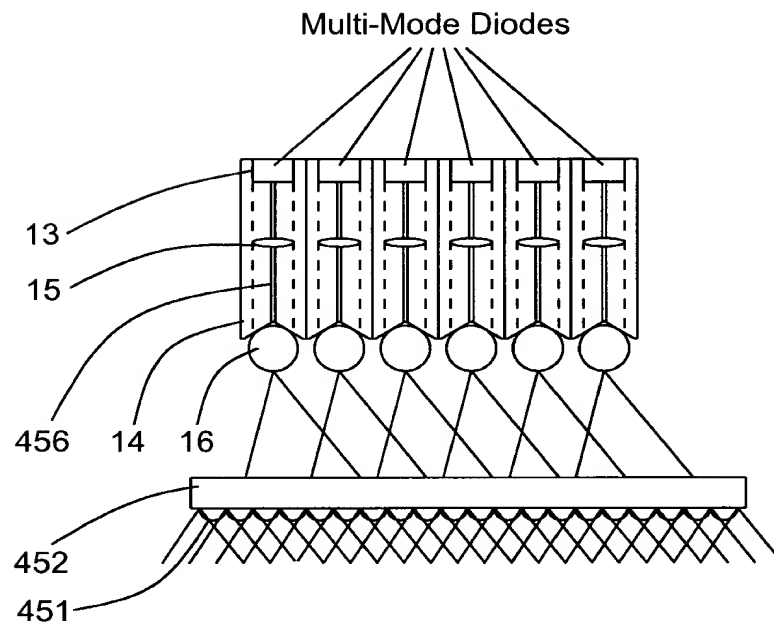


FIG. 1119C

Fifth Generalized Method Of  
 Reducing Speckle-Noise Patterns  
 At Image Detection Array  
 Of The IFD Subsystem (3)

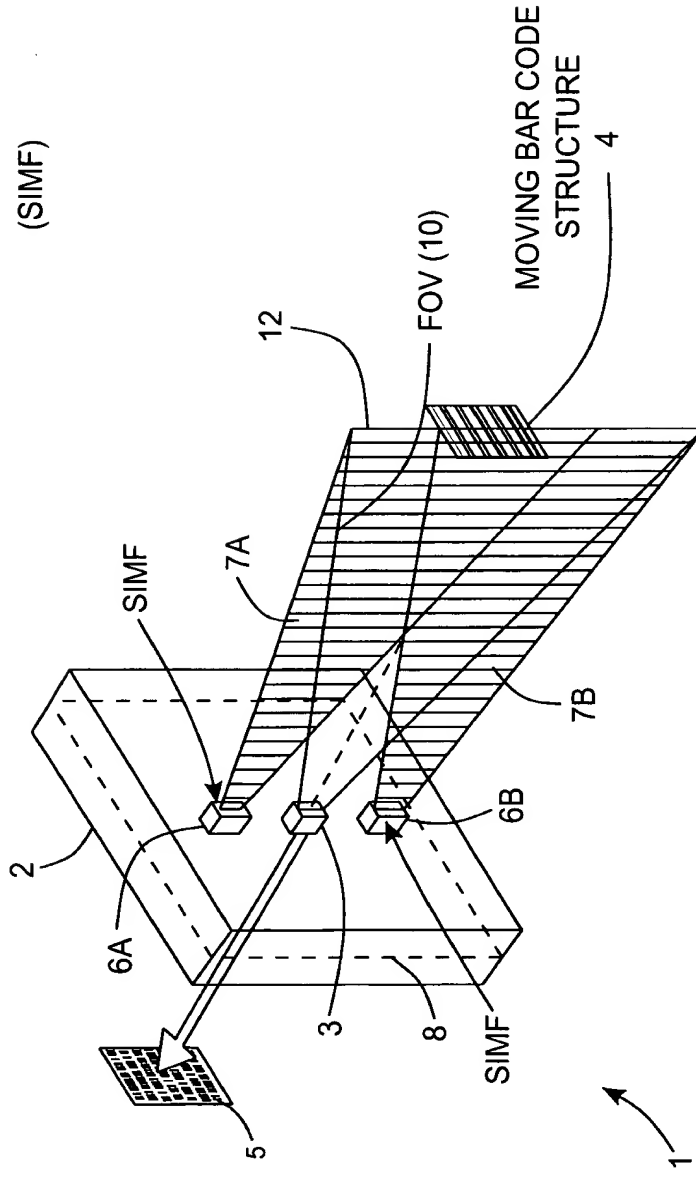


FIG. 1120

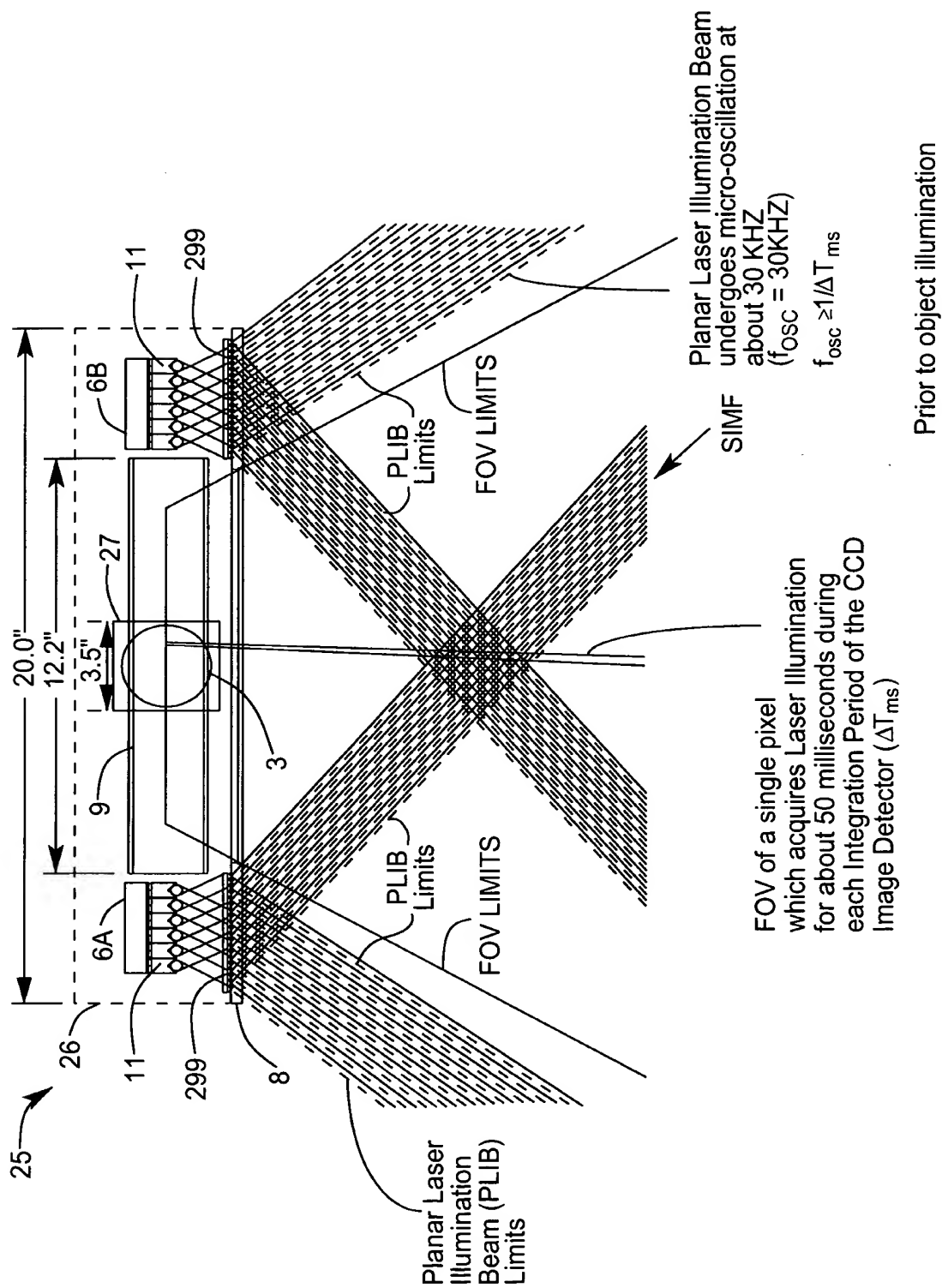


FIG. 1120A





THE FIFTH GENERALIZED SPECKLE-NOISE PATTERN REDUCTION  
METHOD OF THE PRESENT INVENTION

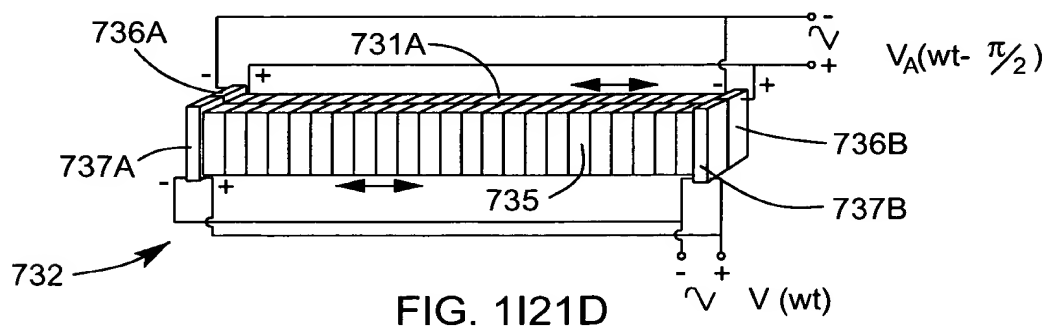
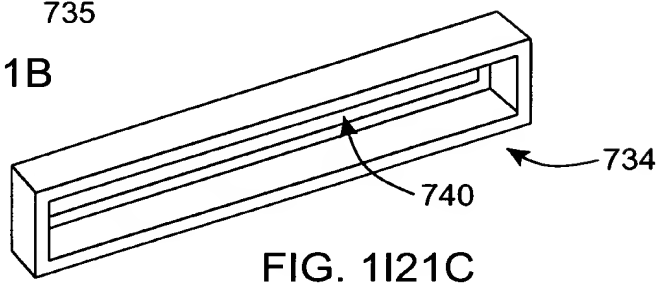
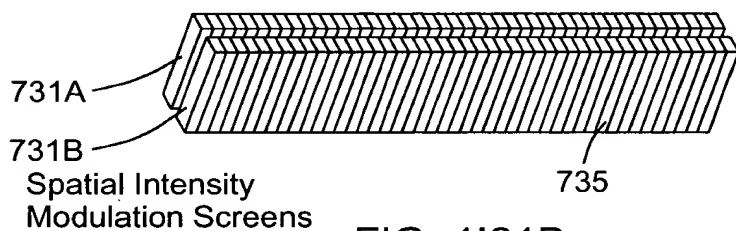
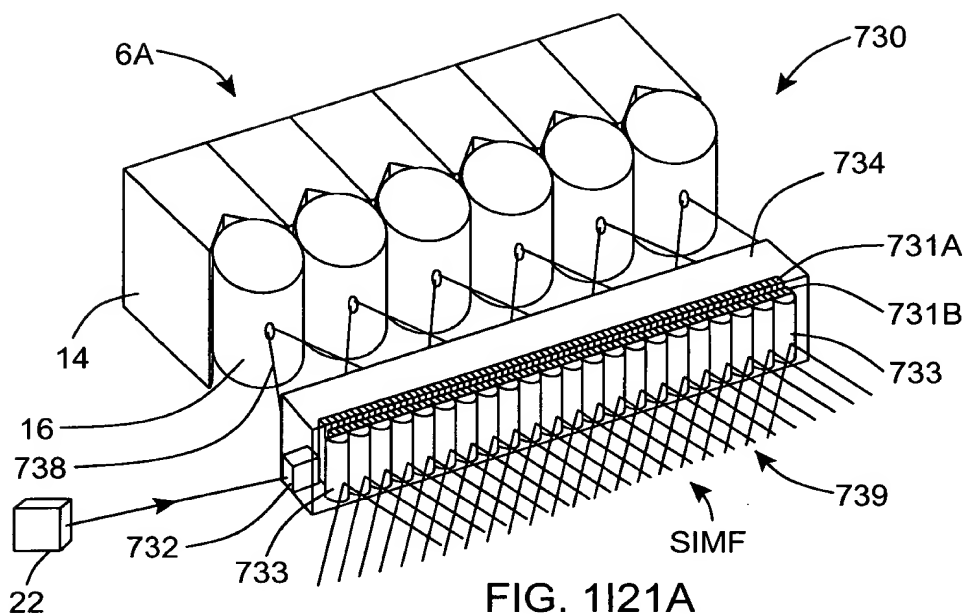
Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the transmitted PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

A

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the power of the speckle-noise pattern observed at the image detection array.

B

FIG. 1120B



Sixth Generalized Method Of  
 Reducing Speckle-Noise Patterns  
 At Image Detection Array  
 Of The IFD Subsystem (3)

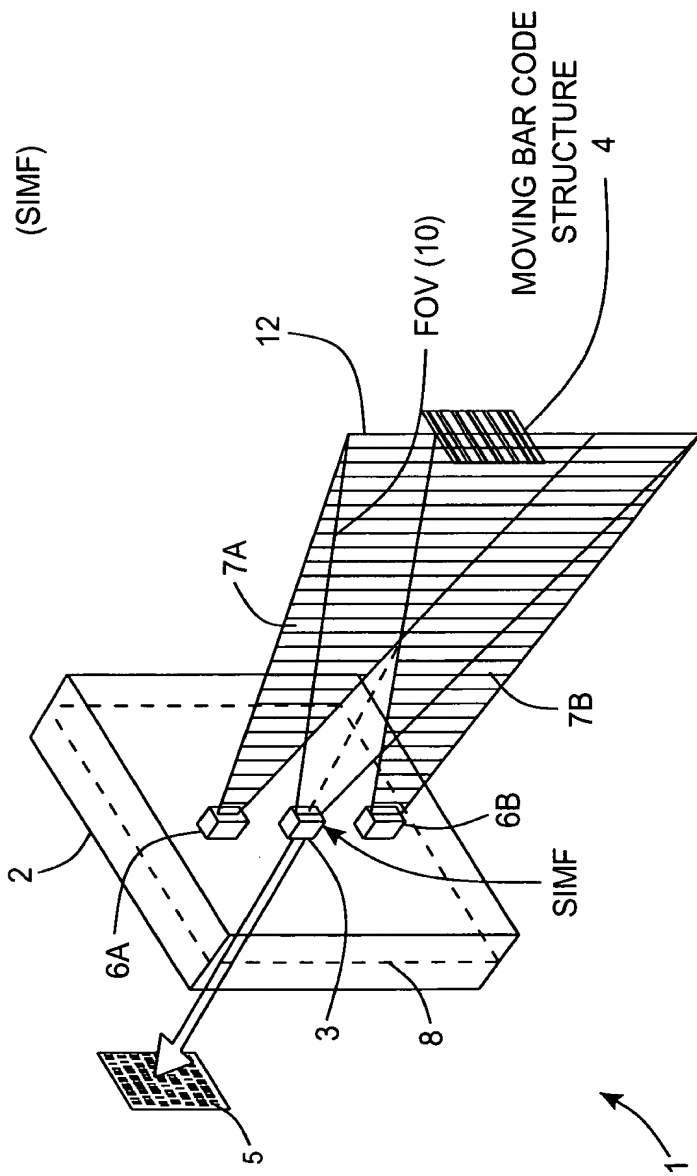
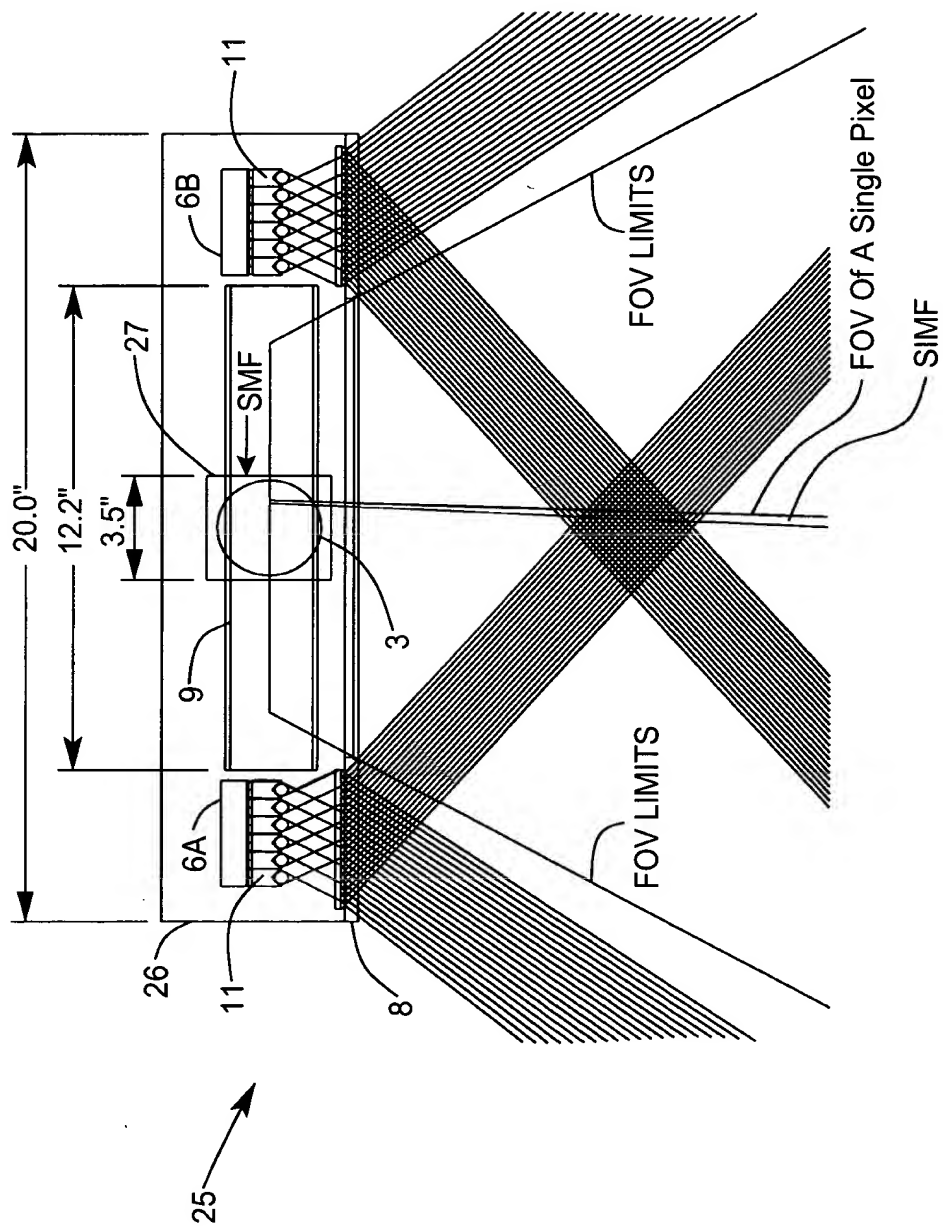


FIG. 1122





THE SIXTH GENERALIZED SPECKLE-NOISE PATTERN REDUCTION  
METHOD OF THE PRESENT INVENTION

After illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

A

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

B

FIG. 1I22B

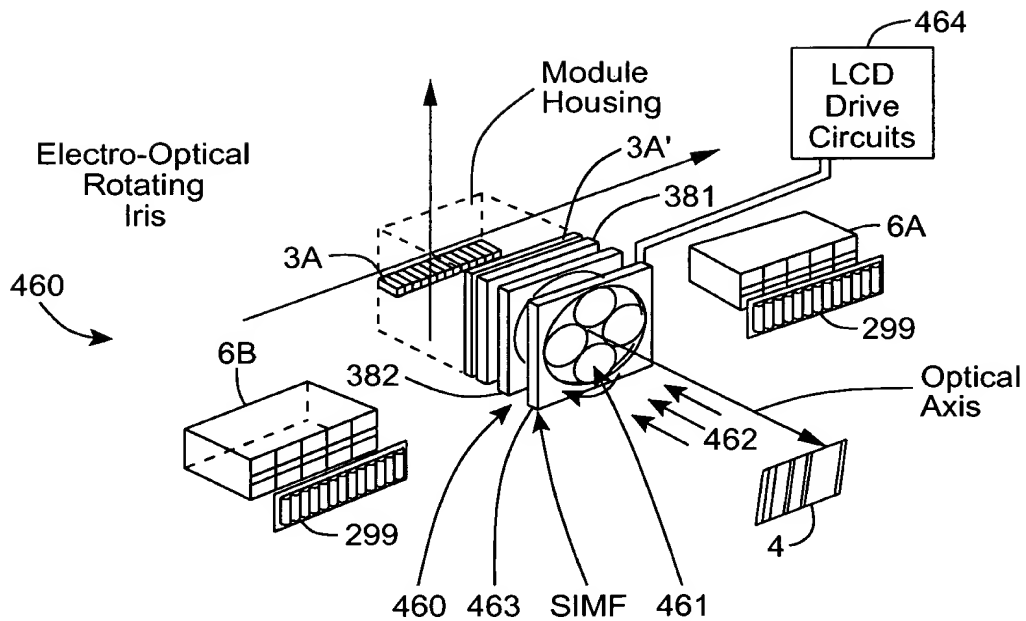


FIG. 1123A

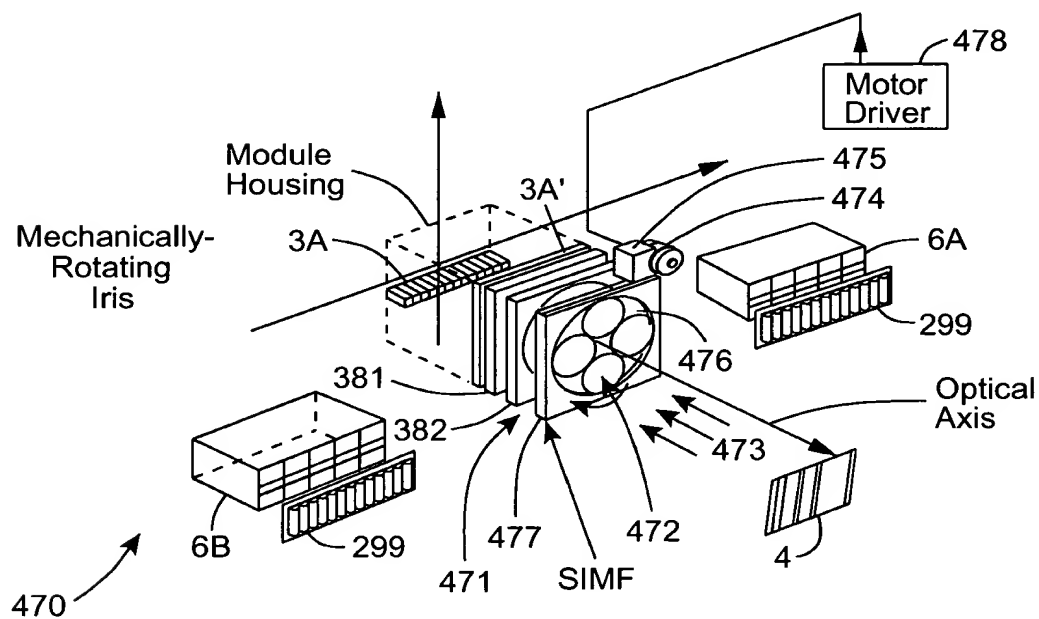
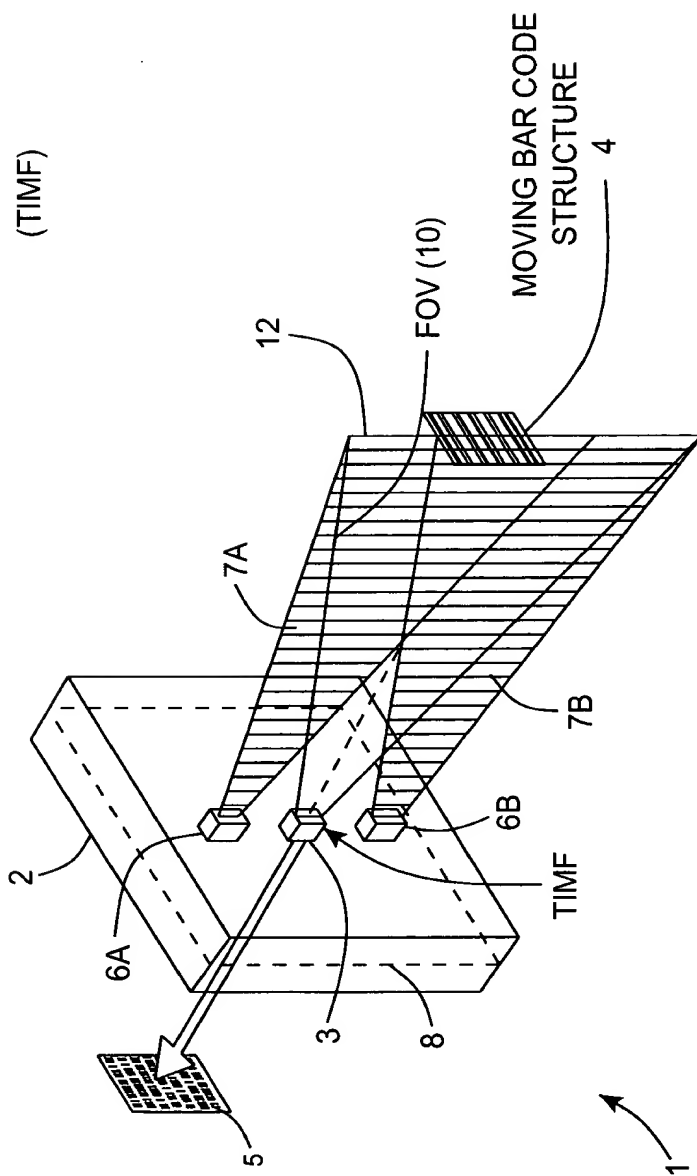


FIG. 1123B

Seventh Generalized Method Of  
Reducing Speckle-Noise Patterns  
At Image Detection Array  
Of The IFD Subsystem (3)



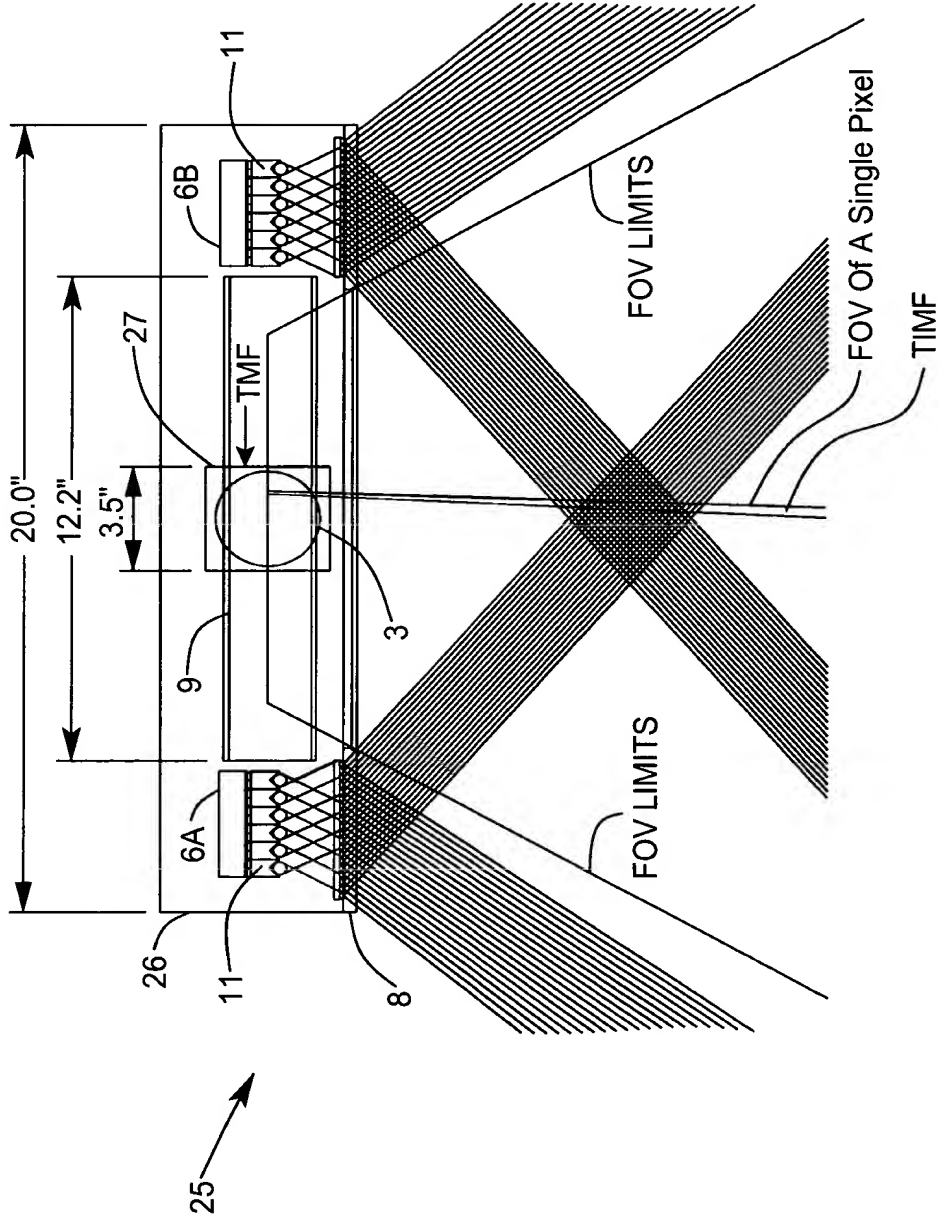


FIG. 1124A





THE SEVENTH GENERALIZED SPECKLE-NOISE PATTERN REDUCTION  
METHOD OF THE PRESENT INVENTION

After illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a temporal intensity modulation function (TIMF) so as to produce many substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

A



Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

B

FIG. 1124B

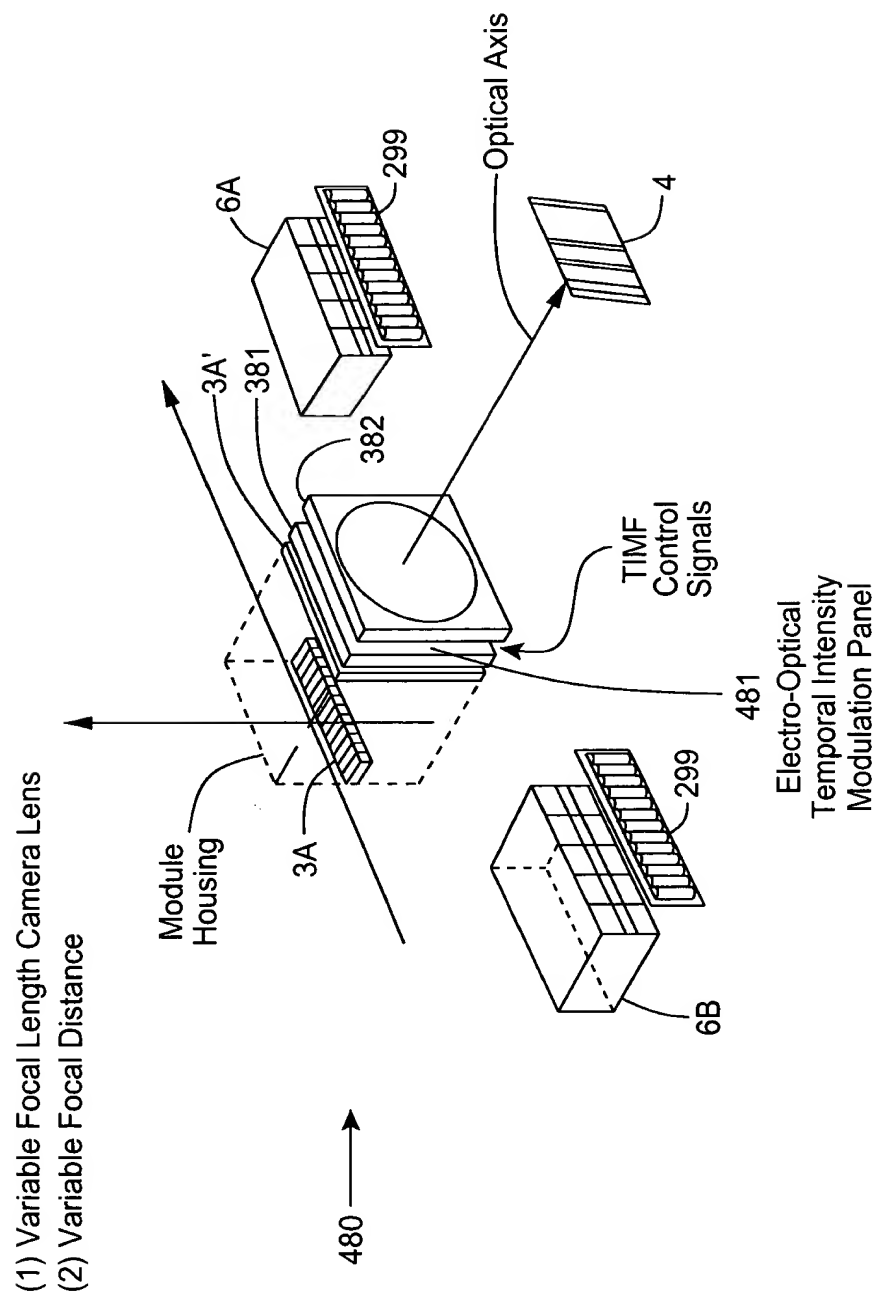


FIG. 1124C



THE EIGHT GENERALIZED SPECKLE-NOISE PATTERN REDUCTION  
METHOD OF THE PRESENT INVENTION

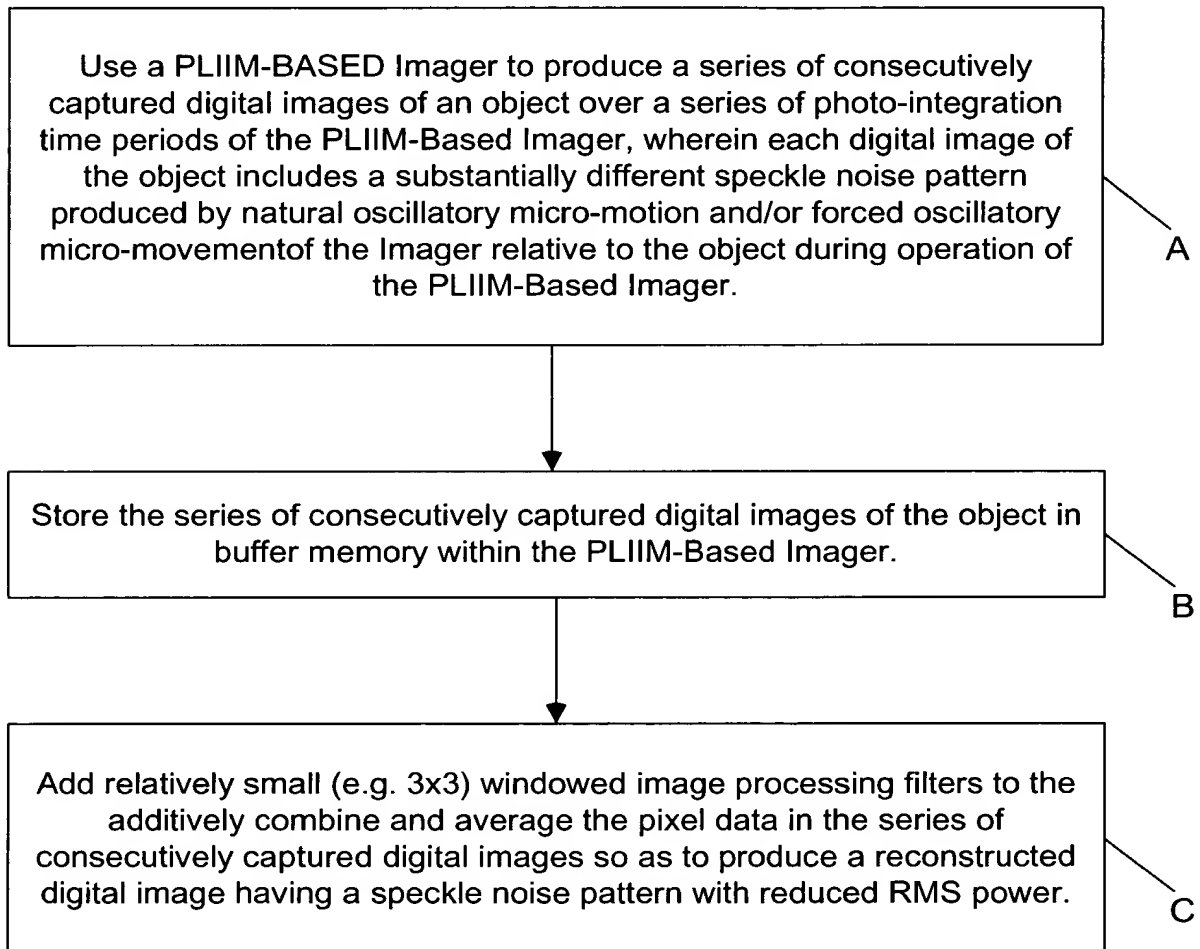
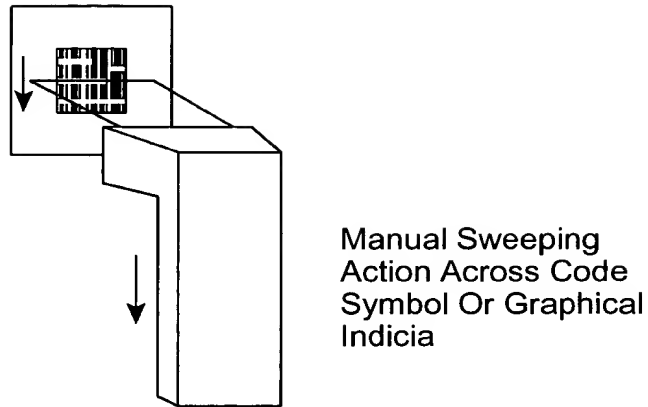
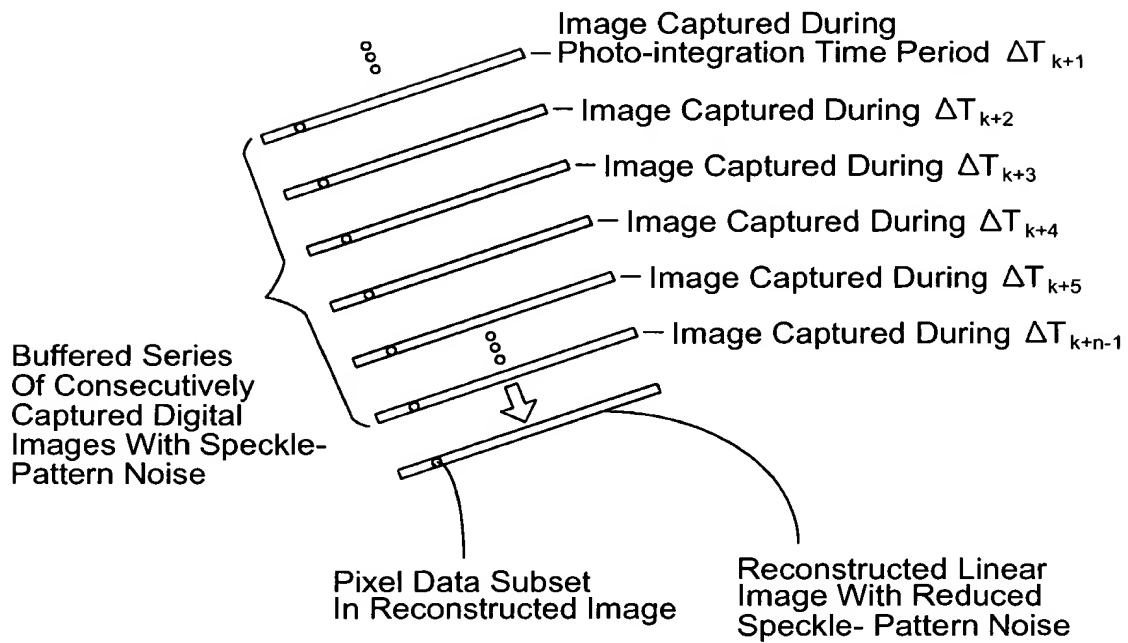


FIG. 1I24D



Manual Sweeping  
Action Across Code  
Symbol Or Graphical  
Indicia

FIG. 1I24E



Case: Linear Imager

FIG. 1I24F

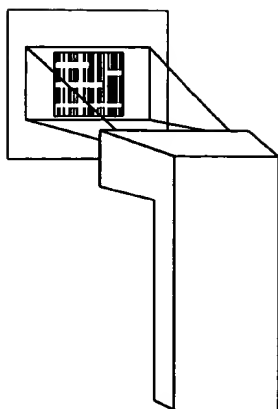
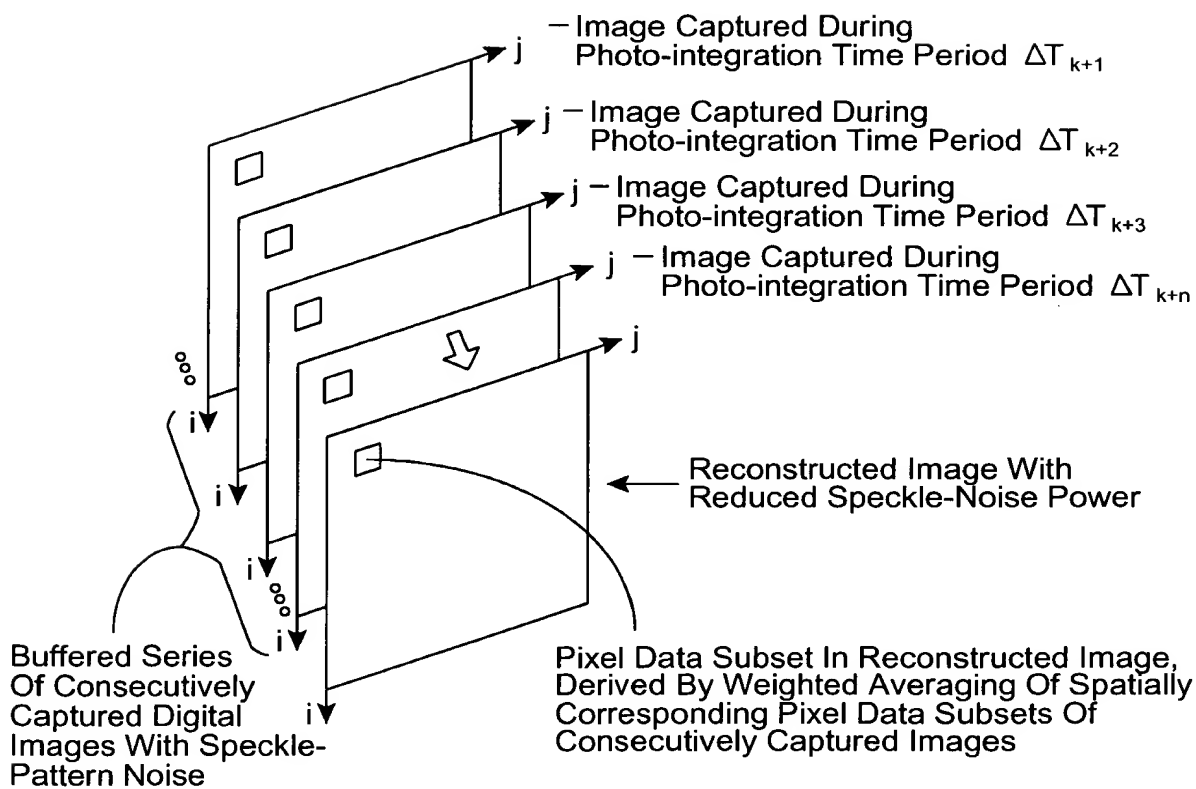


FIG. 1I24G



Case: 2D Area Imager

FIG. 1I24H



THE NINTH GENERALIZED METHOD OF REDUCING SPECKLE PATTERN  
NOISE IN PLIIM-BASED IMAGING SYSTEMS

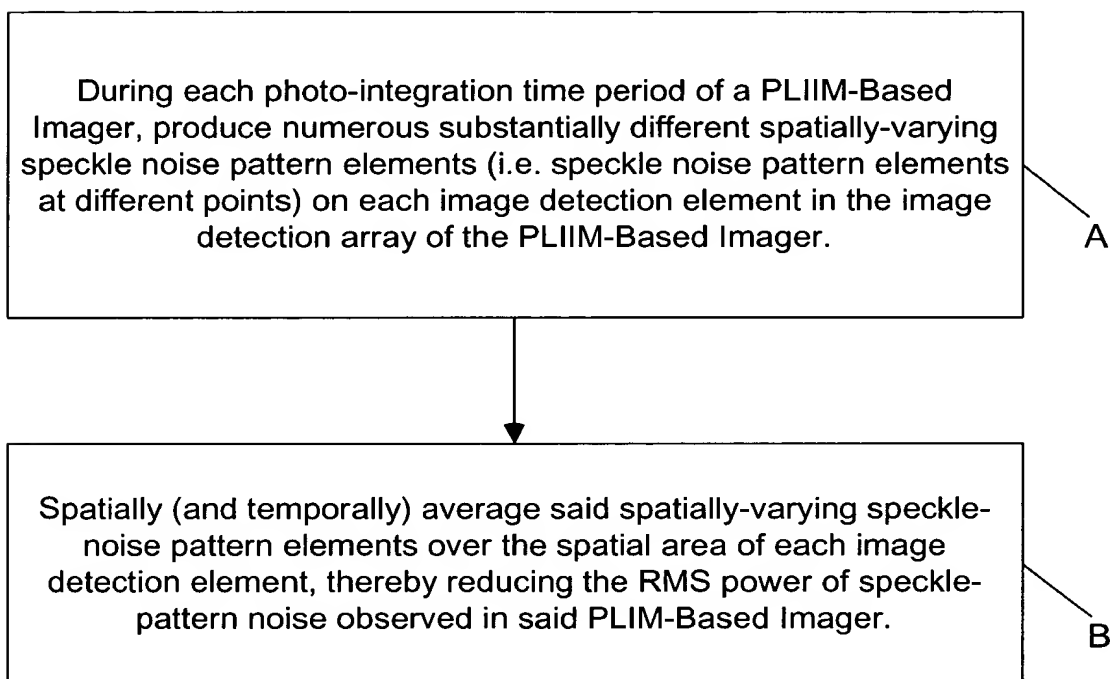
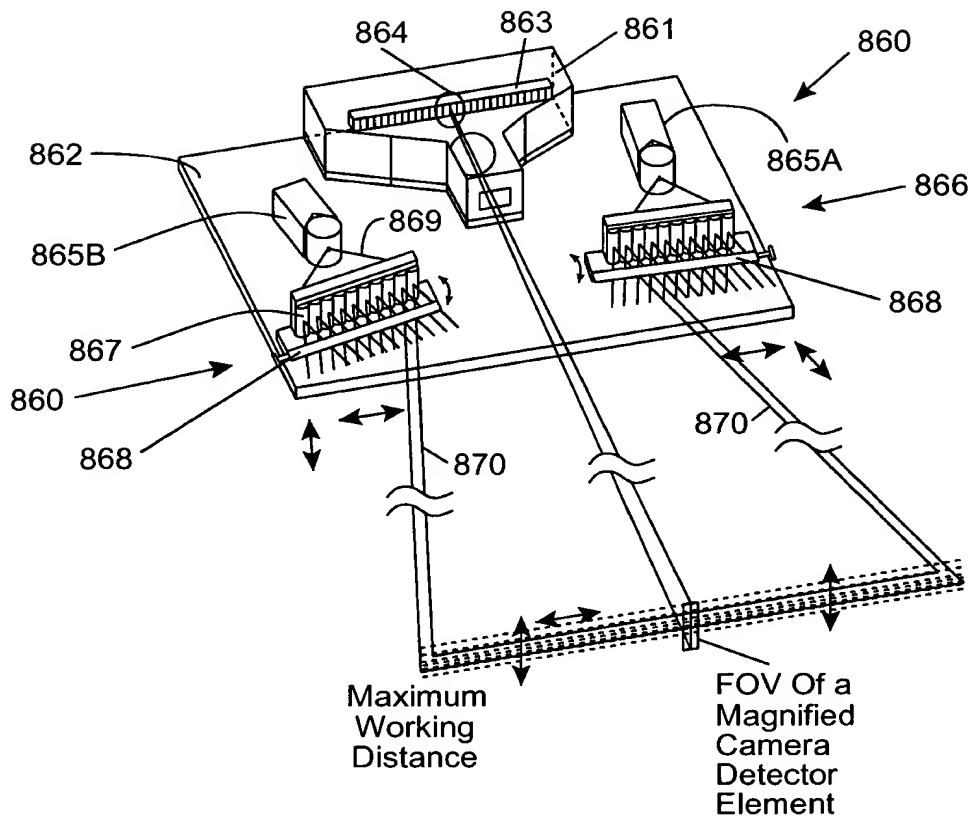


FIG. 1124I



\* Lateral And  
Transverse  
Micro-oscillation  
Of PLIB

FIG. 1I25A1

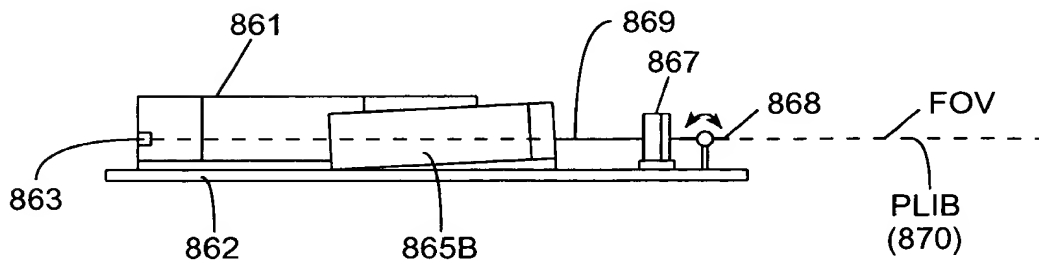


FIG. 1I25A2

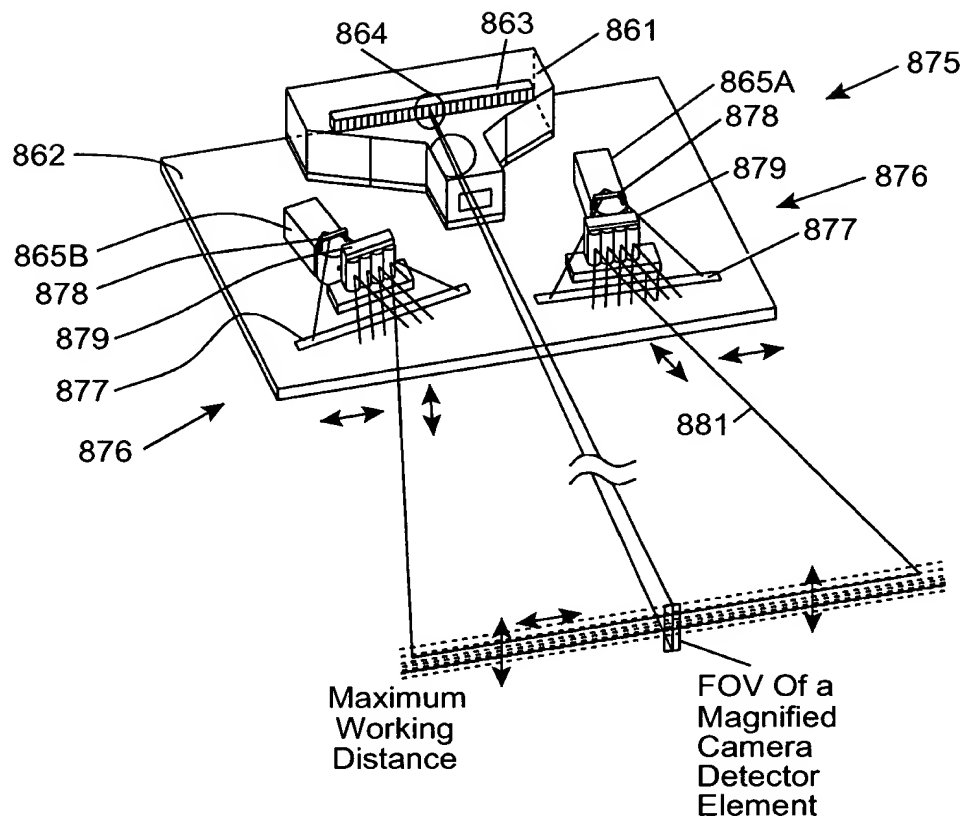


FIG. 1125B1

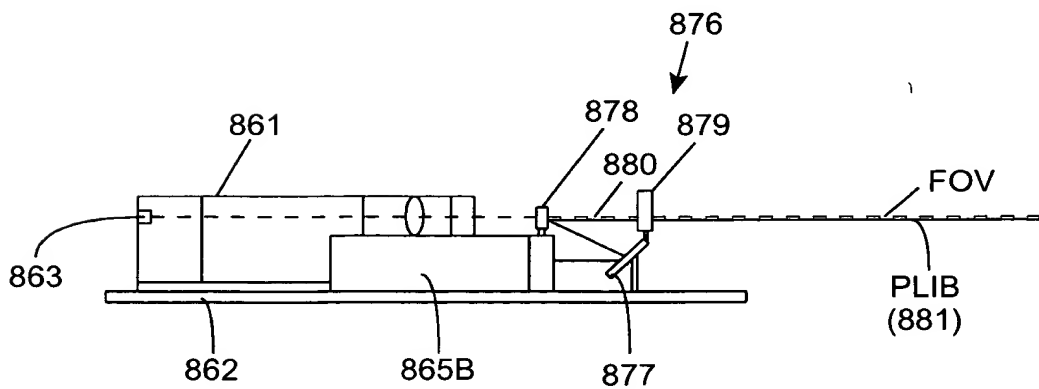
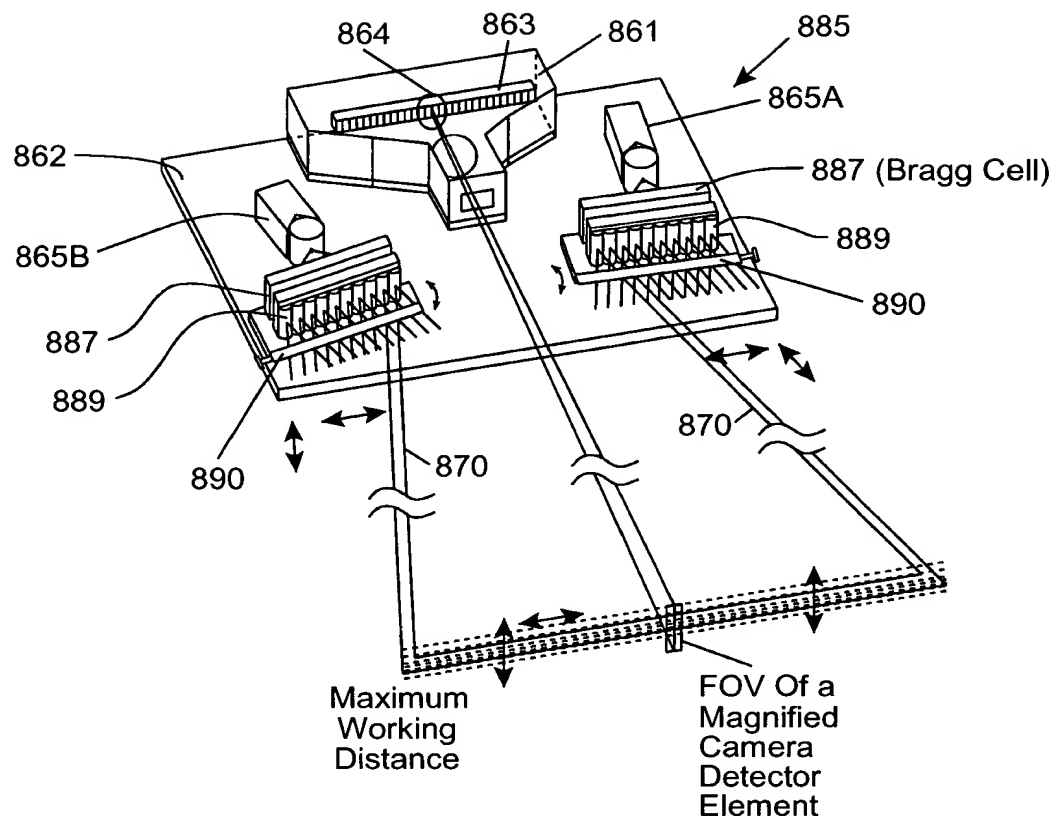


FIG. 1125B2





\* Lateral And  
Transverse  
Micro-oscillation  
Of PLIB

FIG. 1125C1

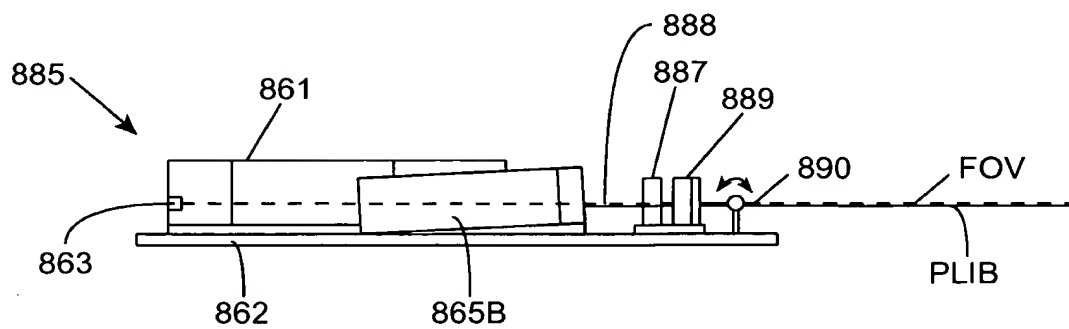


FIG. 1125C2



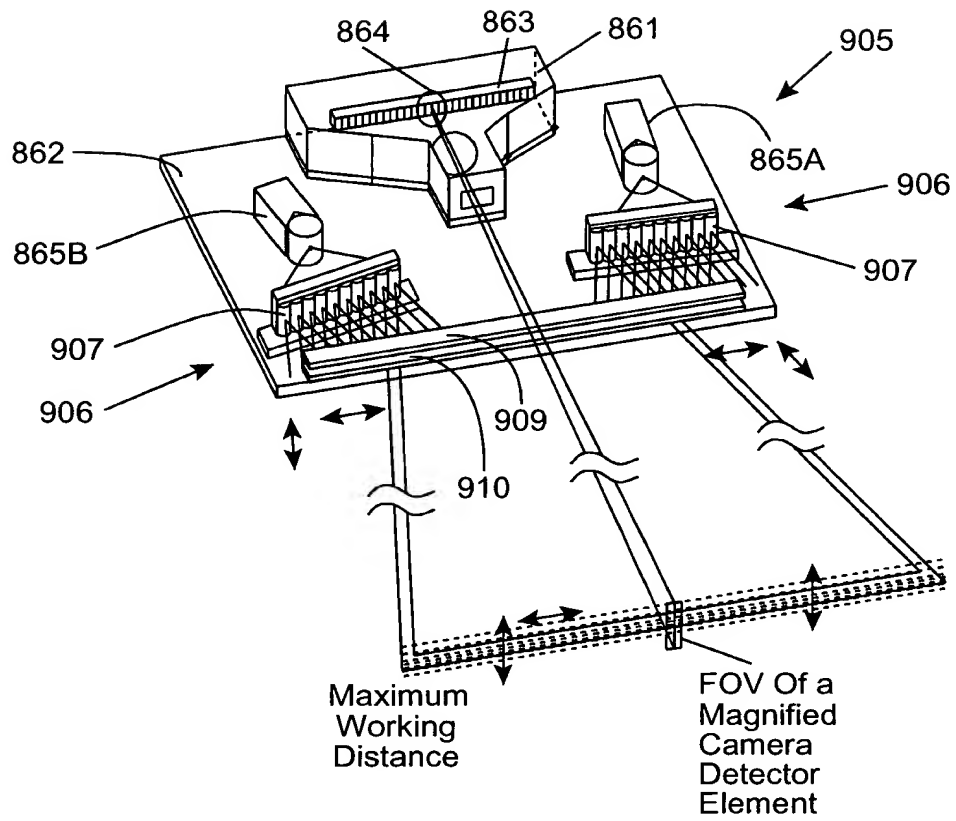


FIG. 1I25E1

\* Lateral And  
Transverse  
Micro-oscillation  
Of PLIB

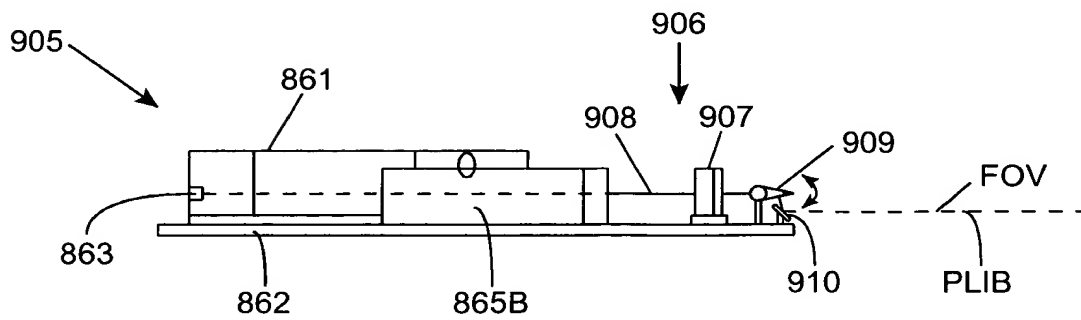


FIG. 1I25E2

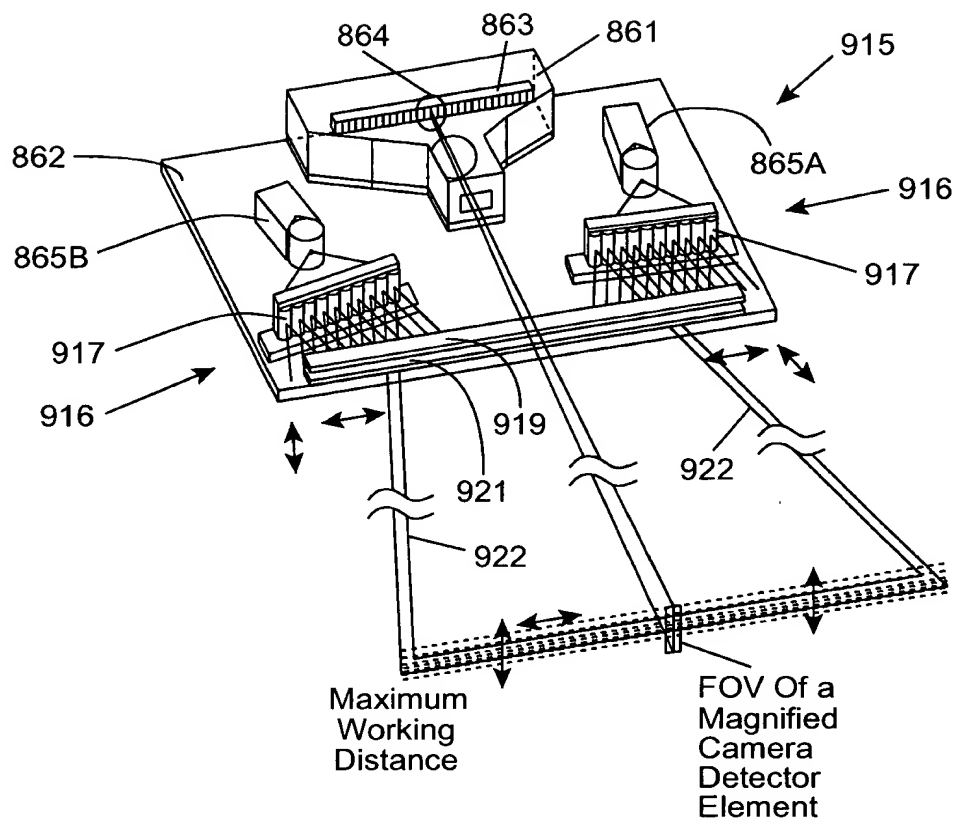


FIG. 1I25F1

\* Lateral And Transverse Micro-oscillation Of PLIB

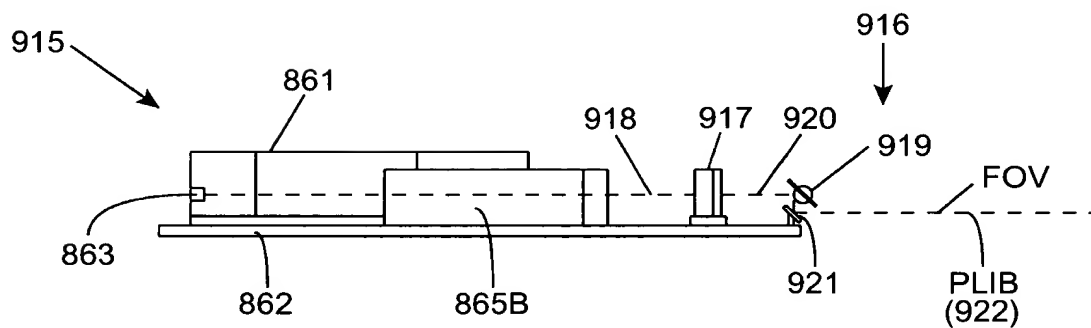
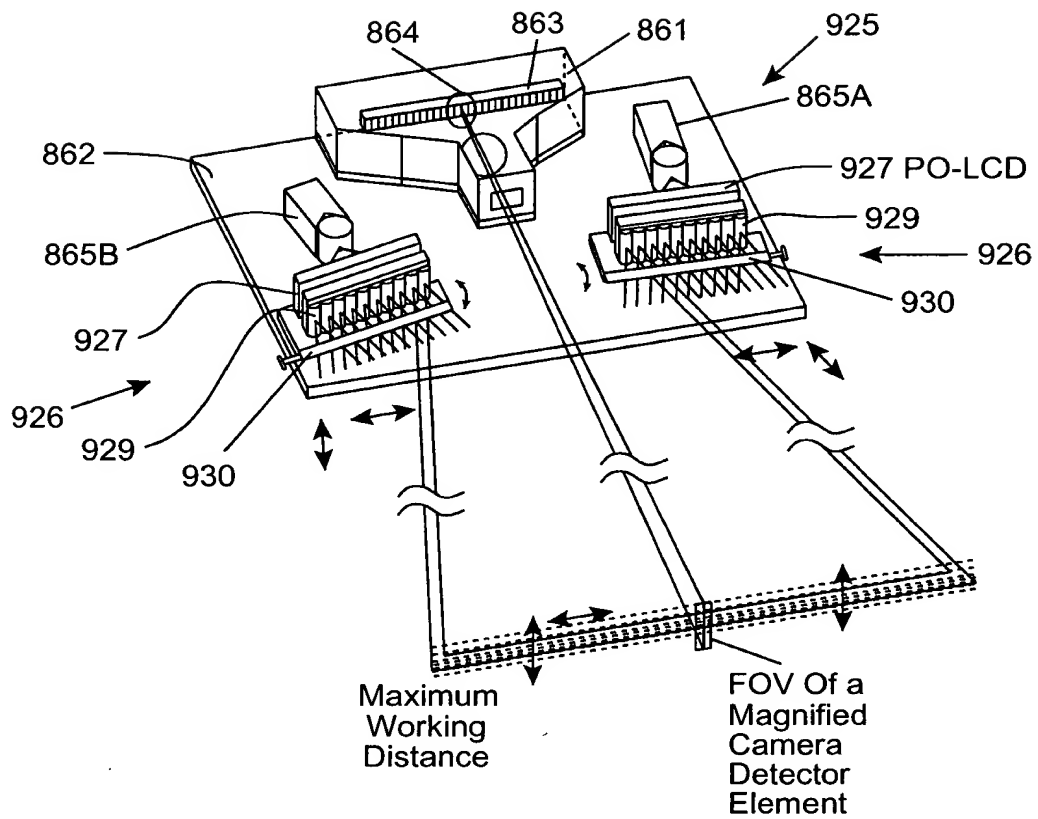


FIG. 1I25F2



\* Lateral And Transverse Micro-oscillation Of PLIB

FIG. 1I25G1

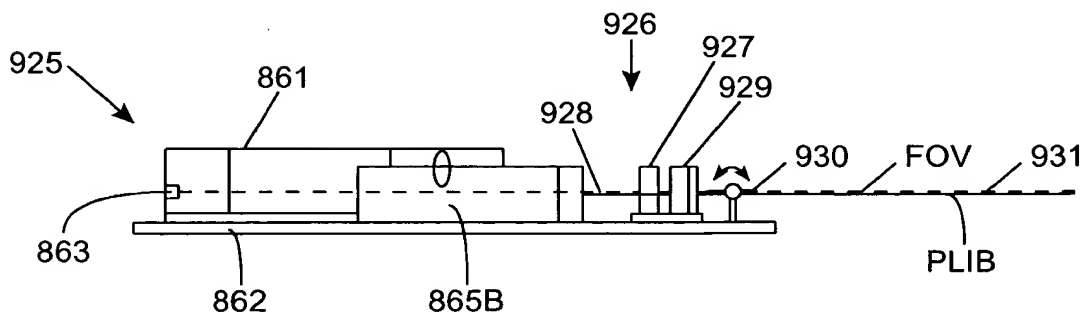


FIG. 1I25G2

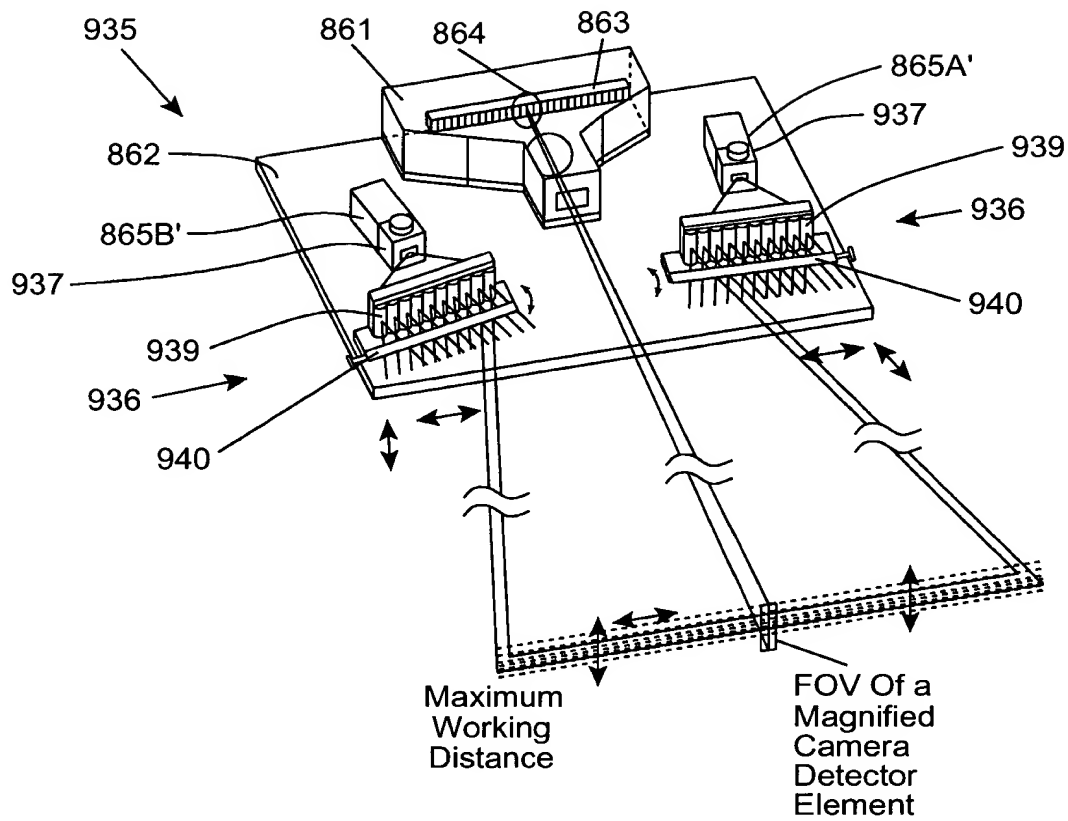


FIG. 1I25H1

\* Lateral And  
Transverse  
Micro-oscillation  
Of PLIB

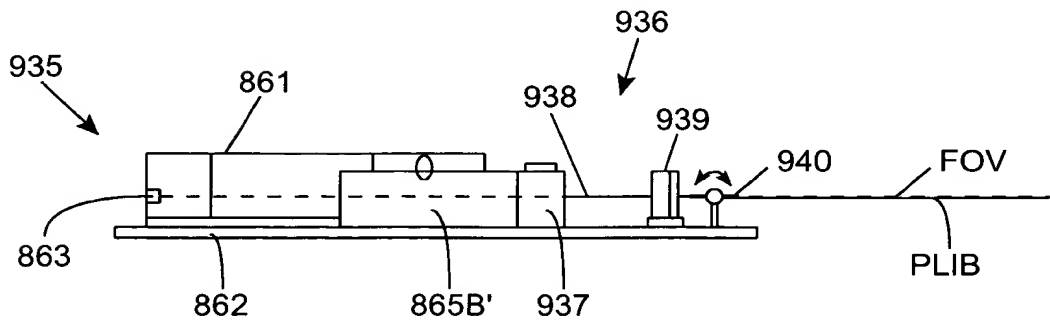


FIG. 1I25H2

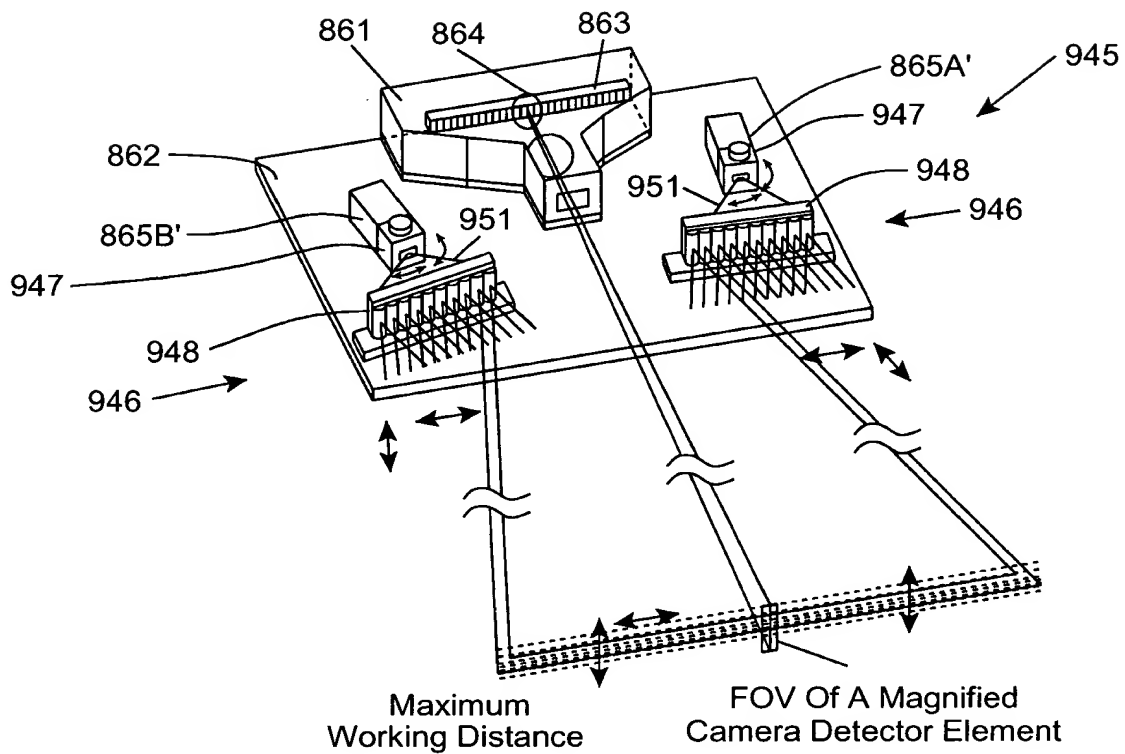


FIG. 1125I1

\* Lateral And  
 Transverse  
 Micro-oscillation  
 Of PLIB

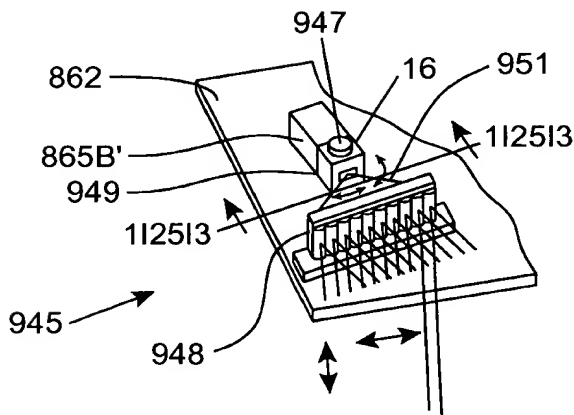


FIG. 1125I2

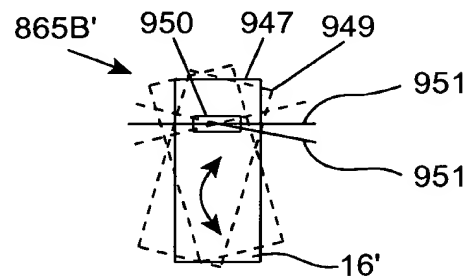


FIG. 1125I3

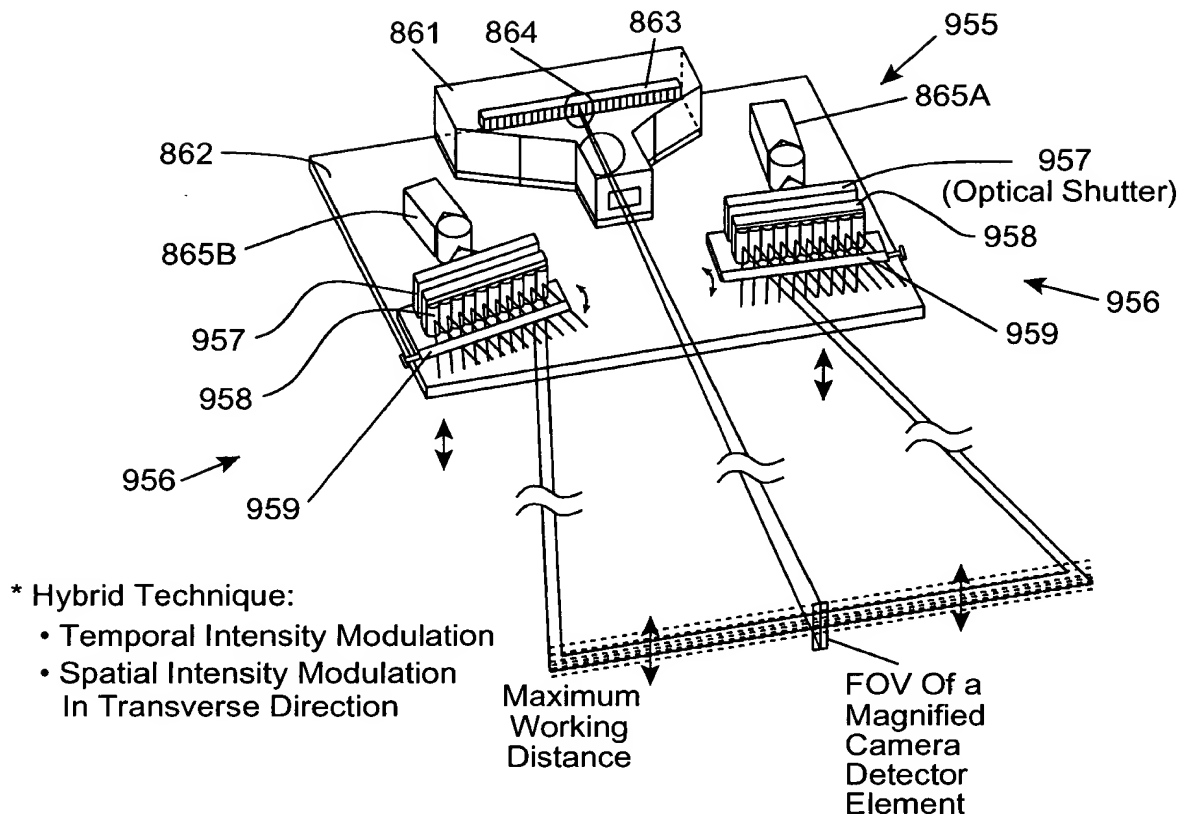


FIG. 1I25J1

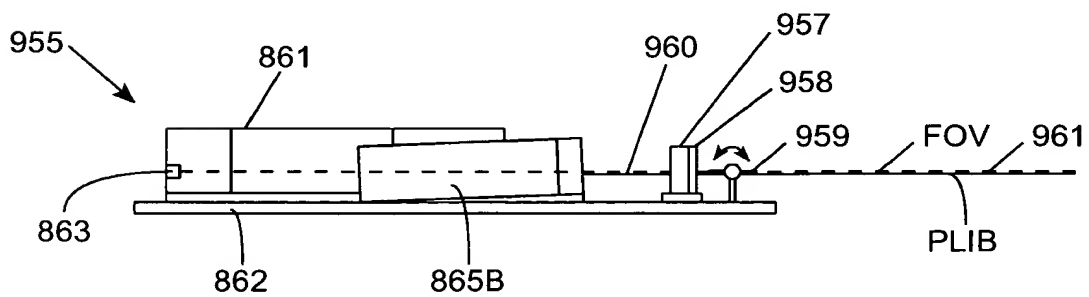


FIG. 1I25J2



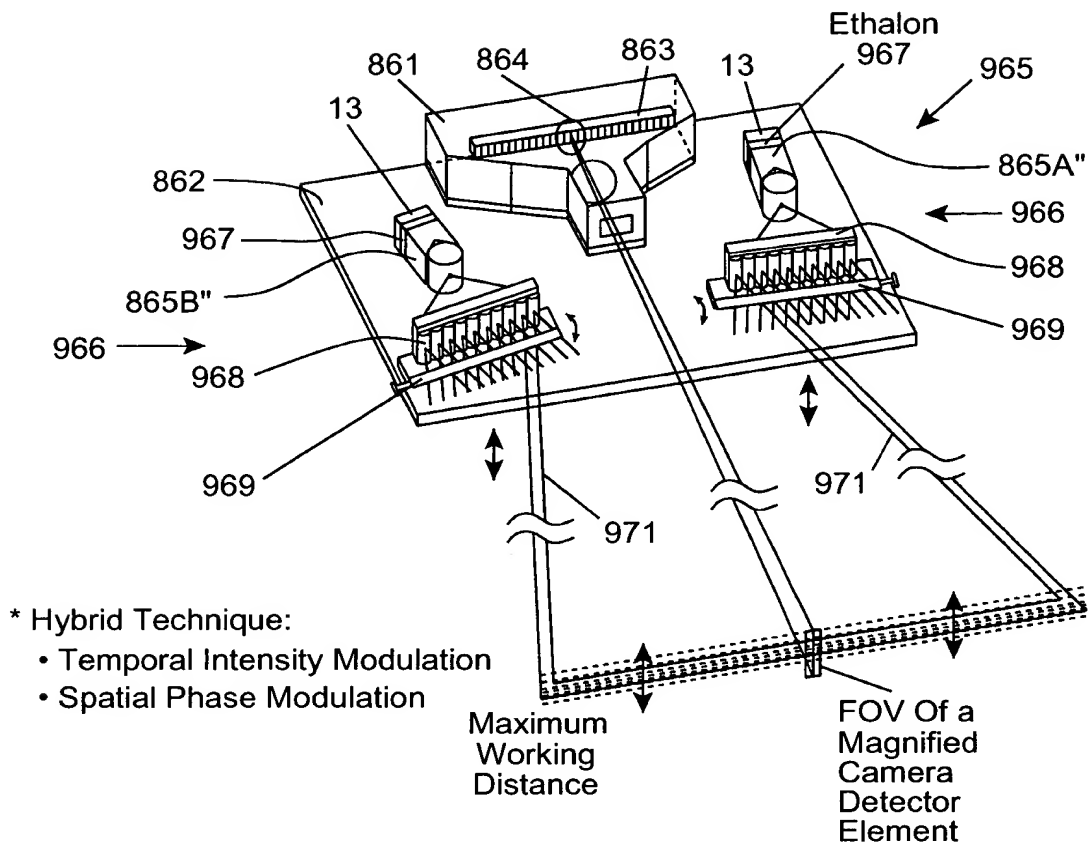


FIG. 1I25K1

\* Transverse Micro-oscillation Of PLIB

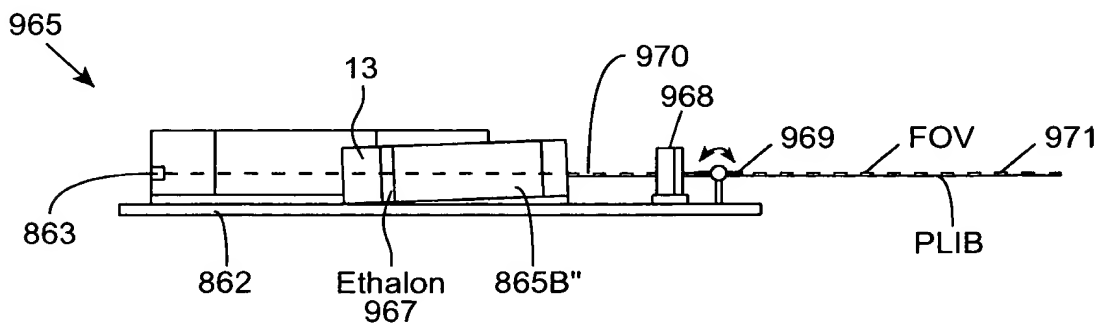
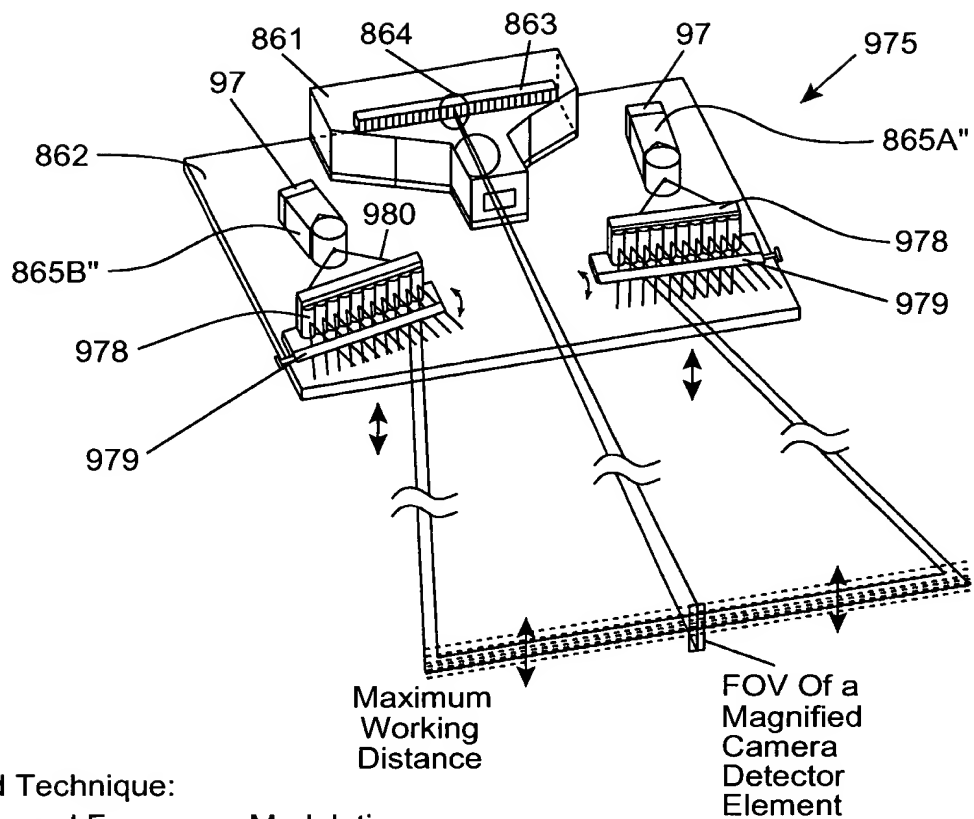


FIG. 1I25K2



- \* Hybrid Technique:
- Temporal Frequency Modulation
  - Spatial Phase Modulation

- \* Transverse  
Micro-oscillation  
Of PLIB

FIG. 1I25L1

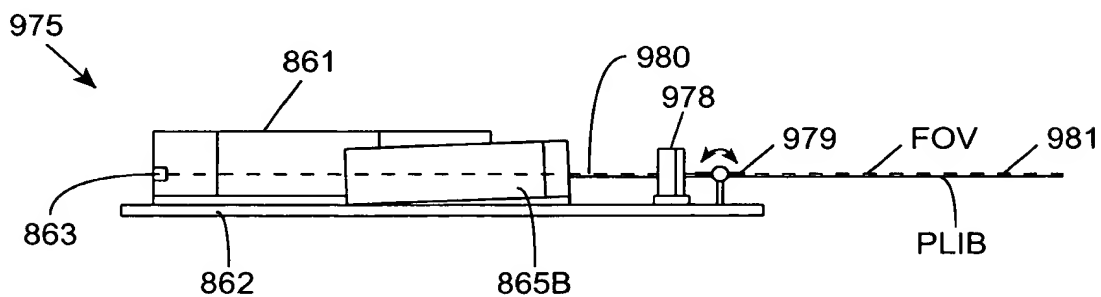


FIG. 1I25L2

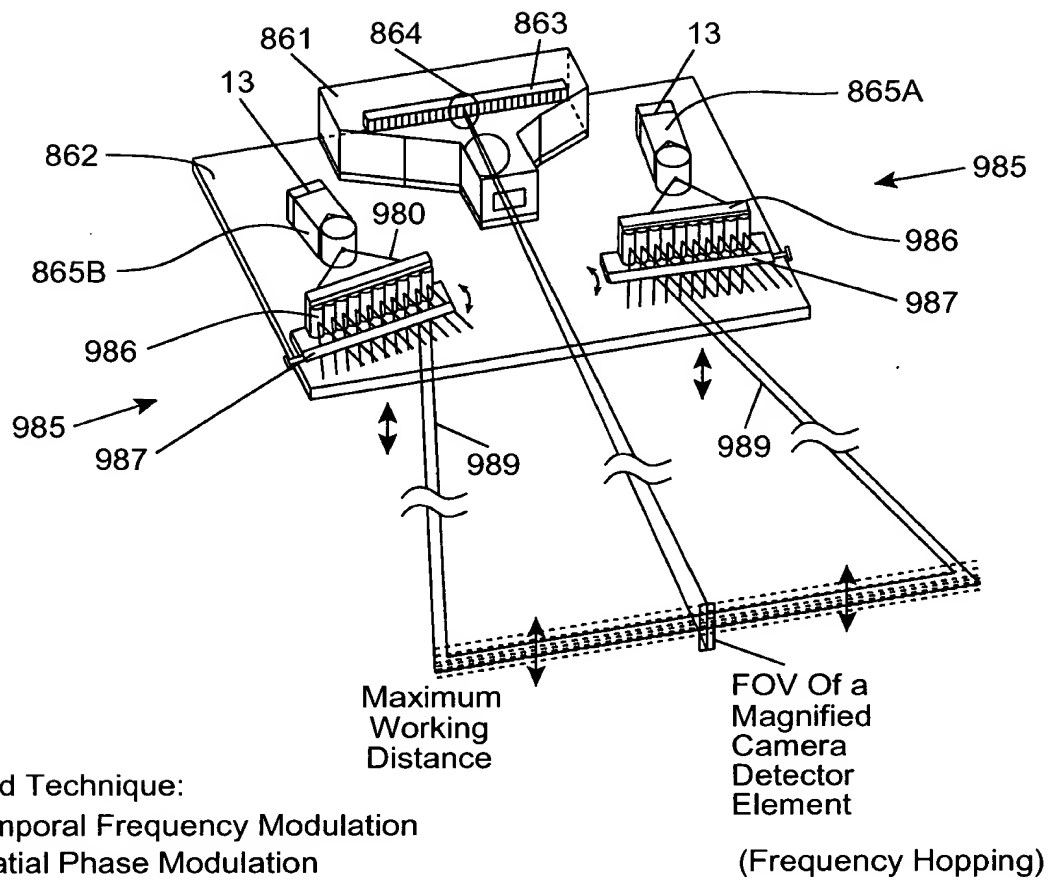


FIG. 1I25M1

\* Transverse  
Micro-oscillation  
Of PLIB

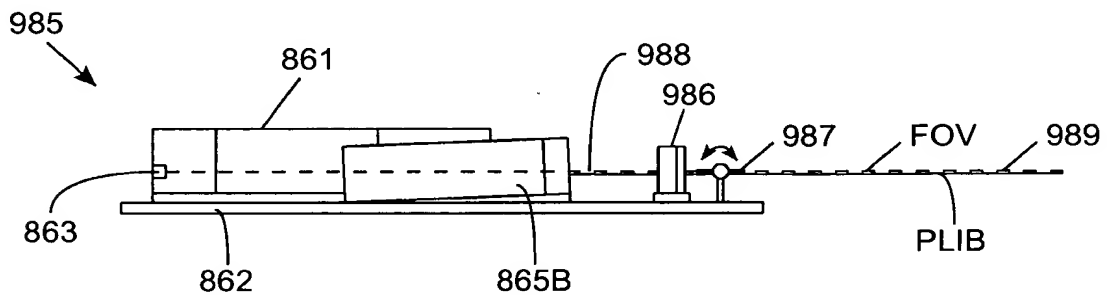
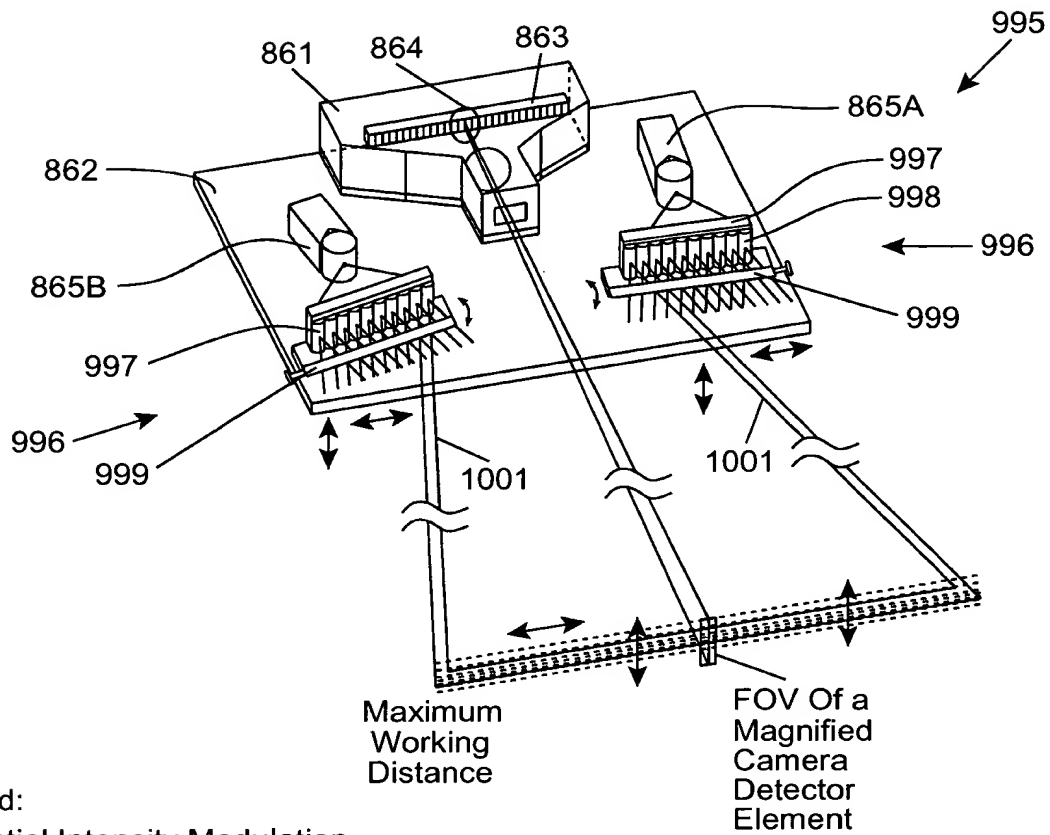


FIG. 1I25M2



- \* Hybrid:
  - Spatial Intensity Modulation
  - Spatial Phase Modulation

FIG. 1I25N1

- \* Lateral And Transverse Micro-oscillation Of PLIB

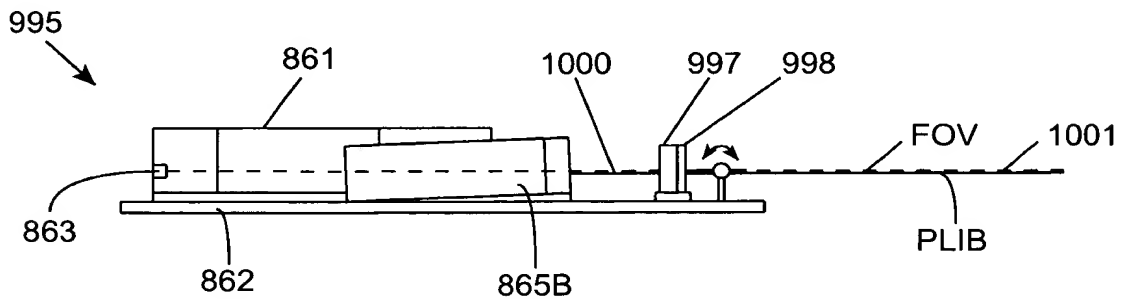


FIG. 1I25N2

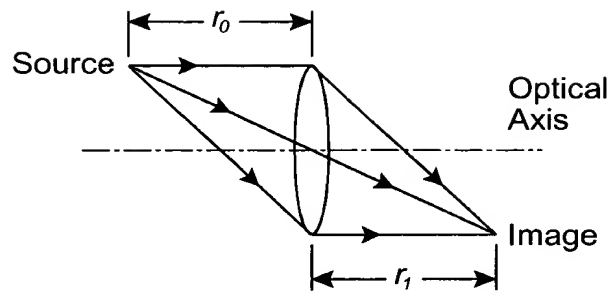


FIG. 1H1

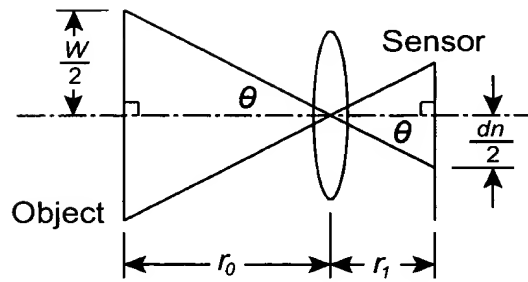


FIG. 1H2

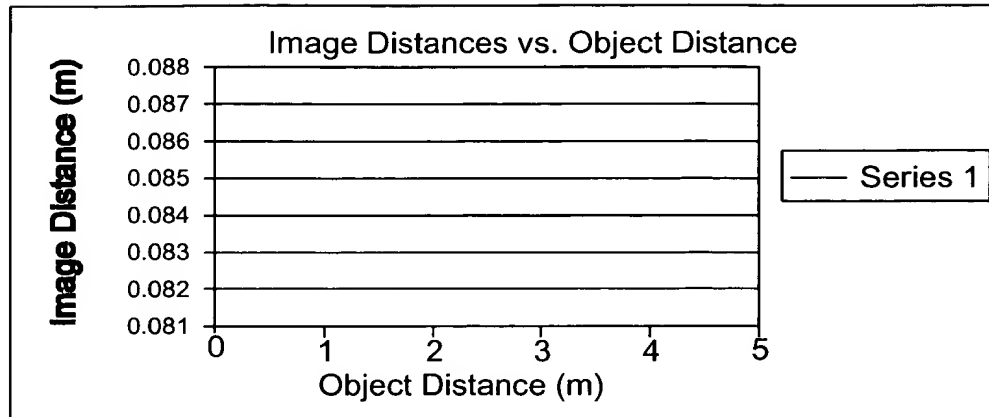


FIG. 1H3

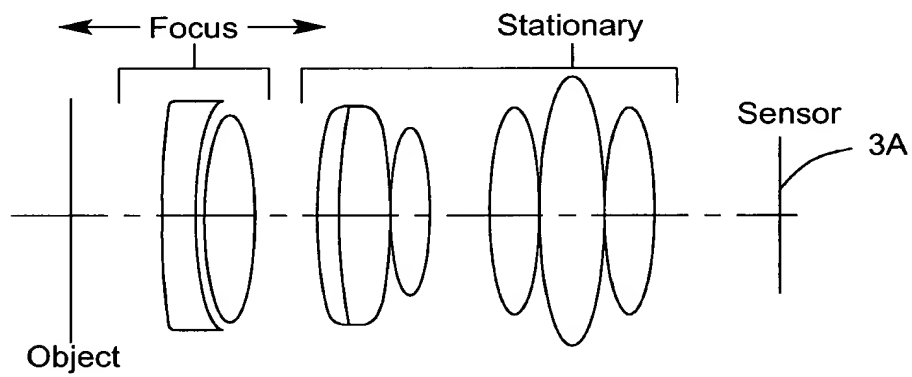


FIG. 1H4

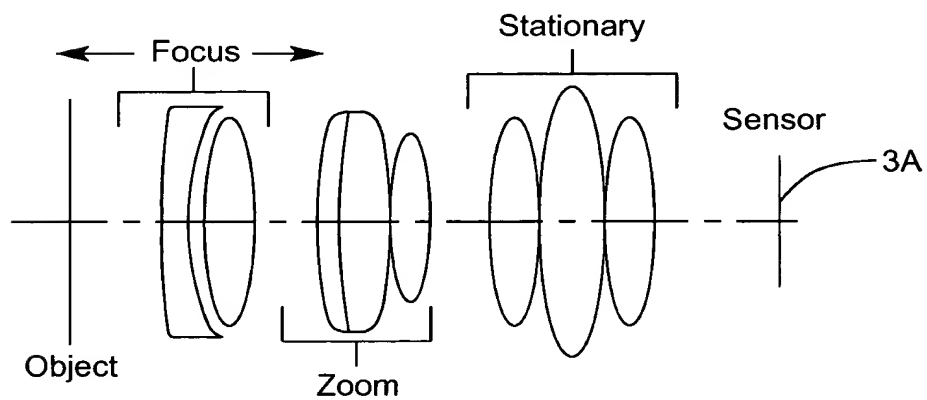


FIG. 1H5



Fixed Focal Length  
Lens Cases

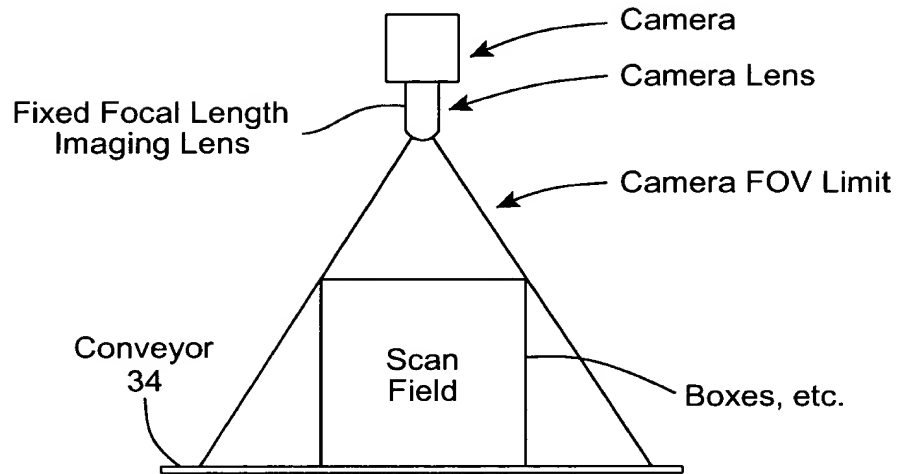


FIG. 1K1

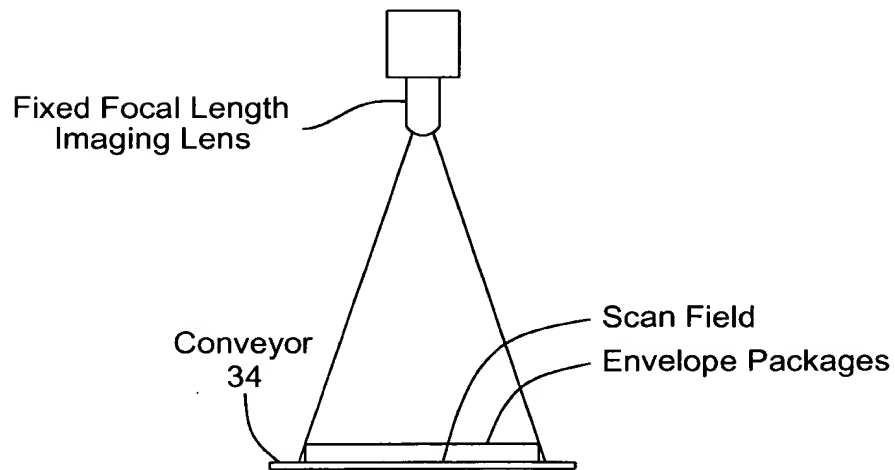


FIG. 1K2

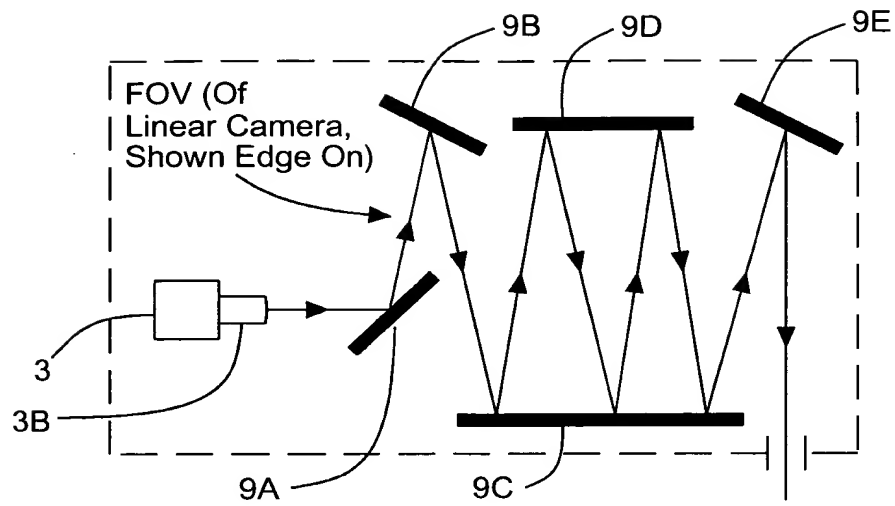


FIG. 1L1

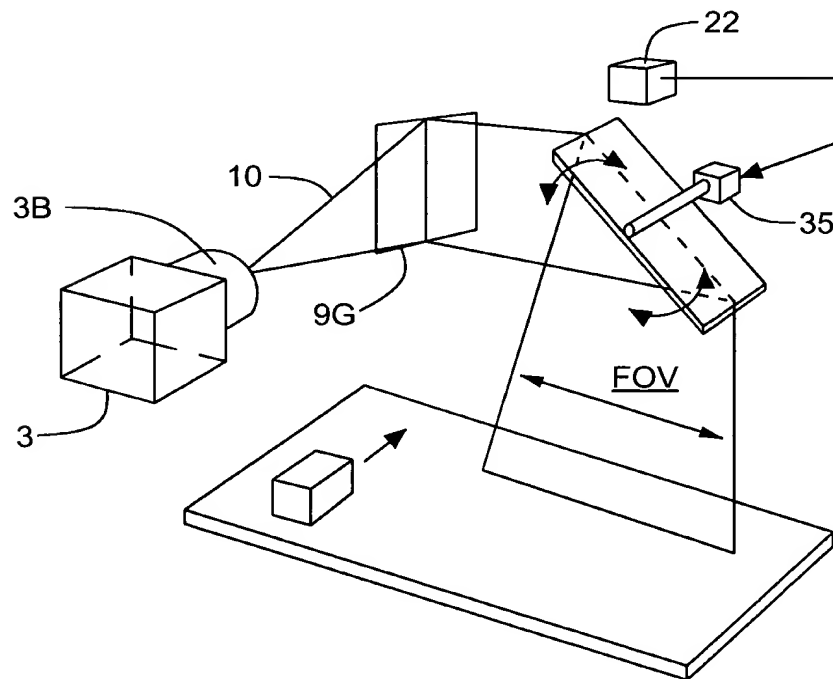


FIG. 1L2





Pixel Power Density vs. Object Distance (General Example)

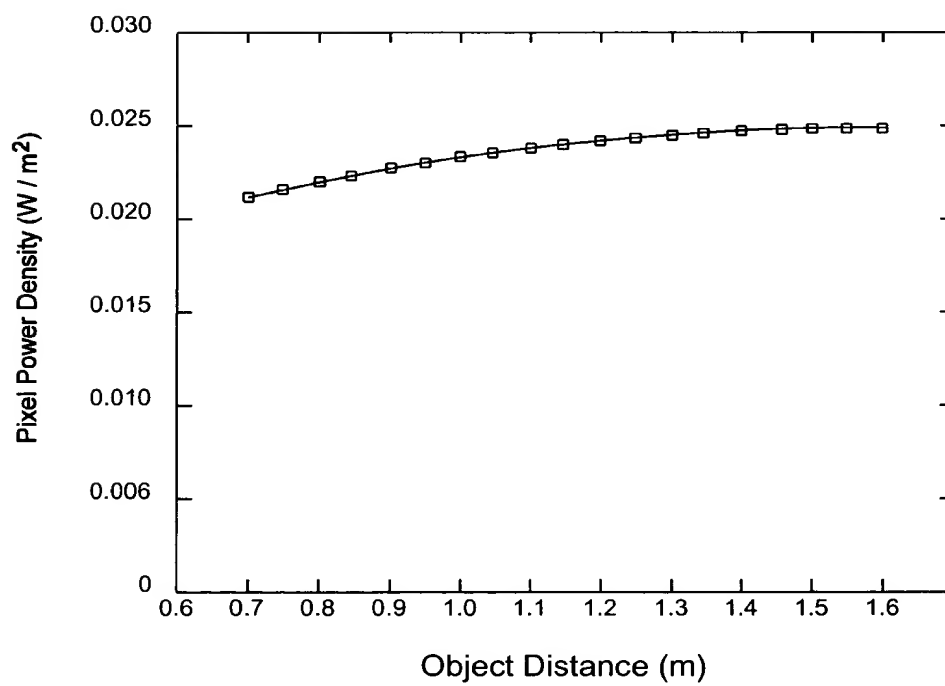


FIG. 1M1

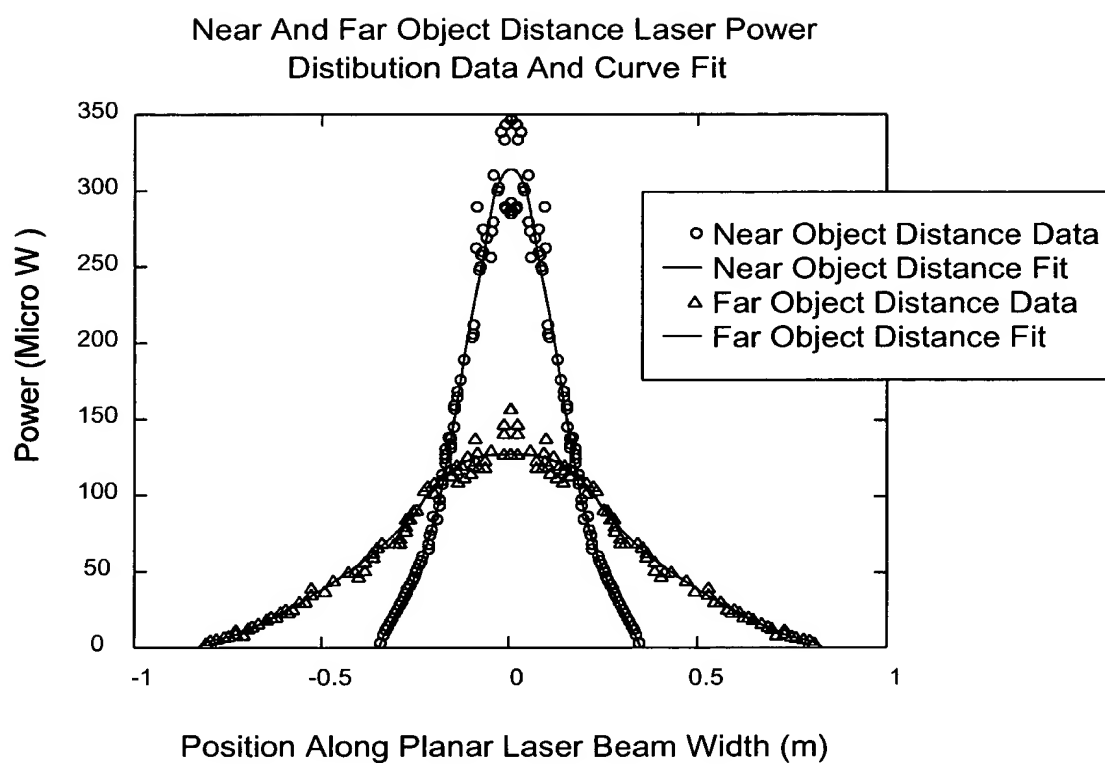


FIG. 1M2



Planar Laser Beam Width vs. Object Distance

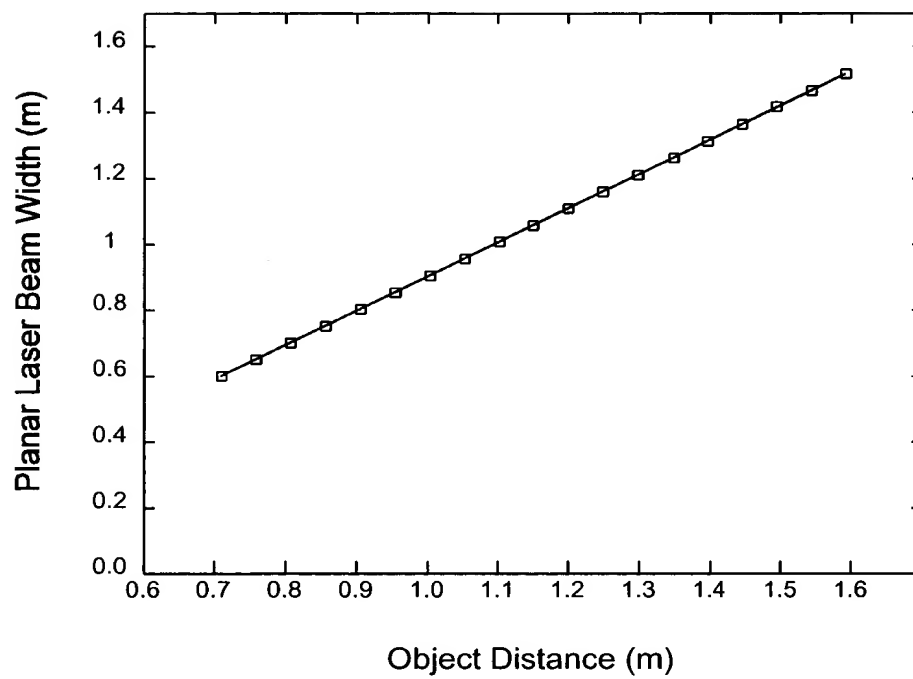


FIG. 1M3



Planar Laser Beam Height vs.  
Object Distance (Far Object Distance Focus)

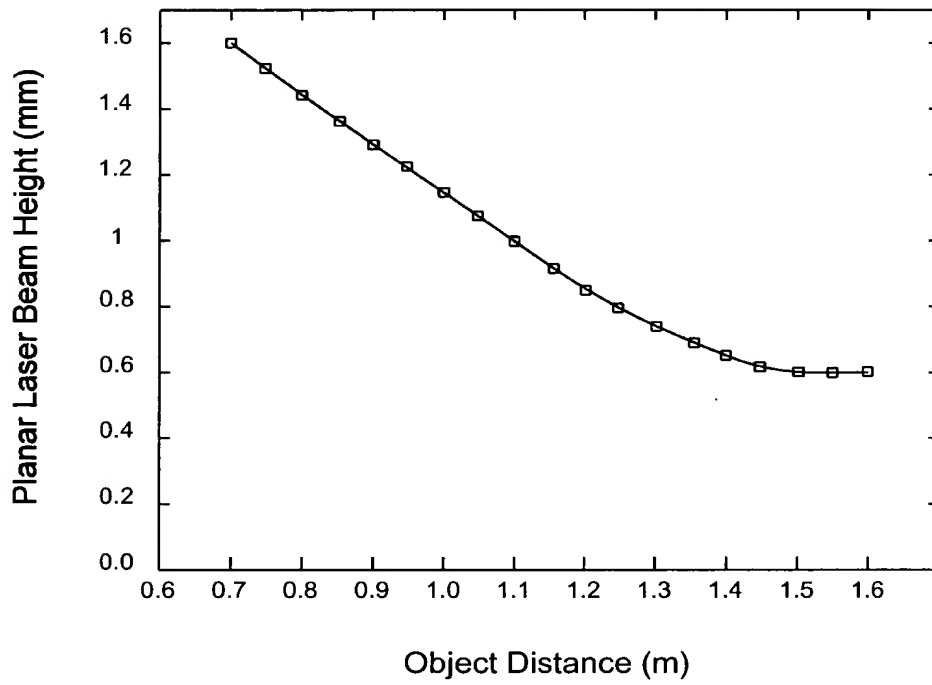


FIG. 1M4

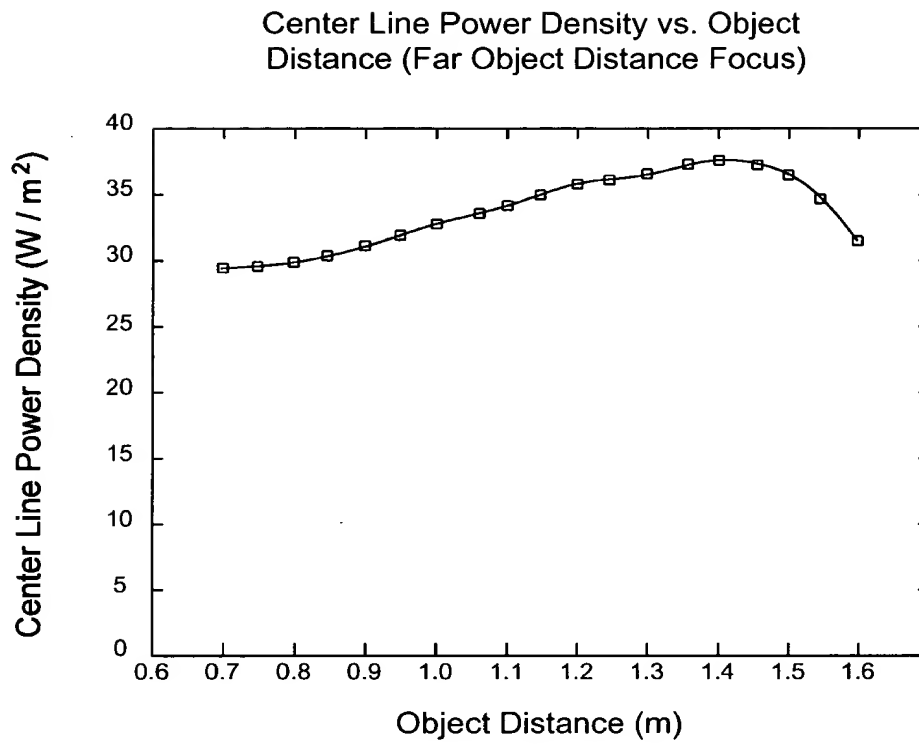


FIG. 1N

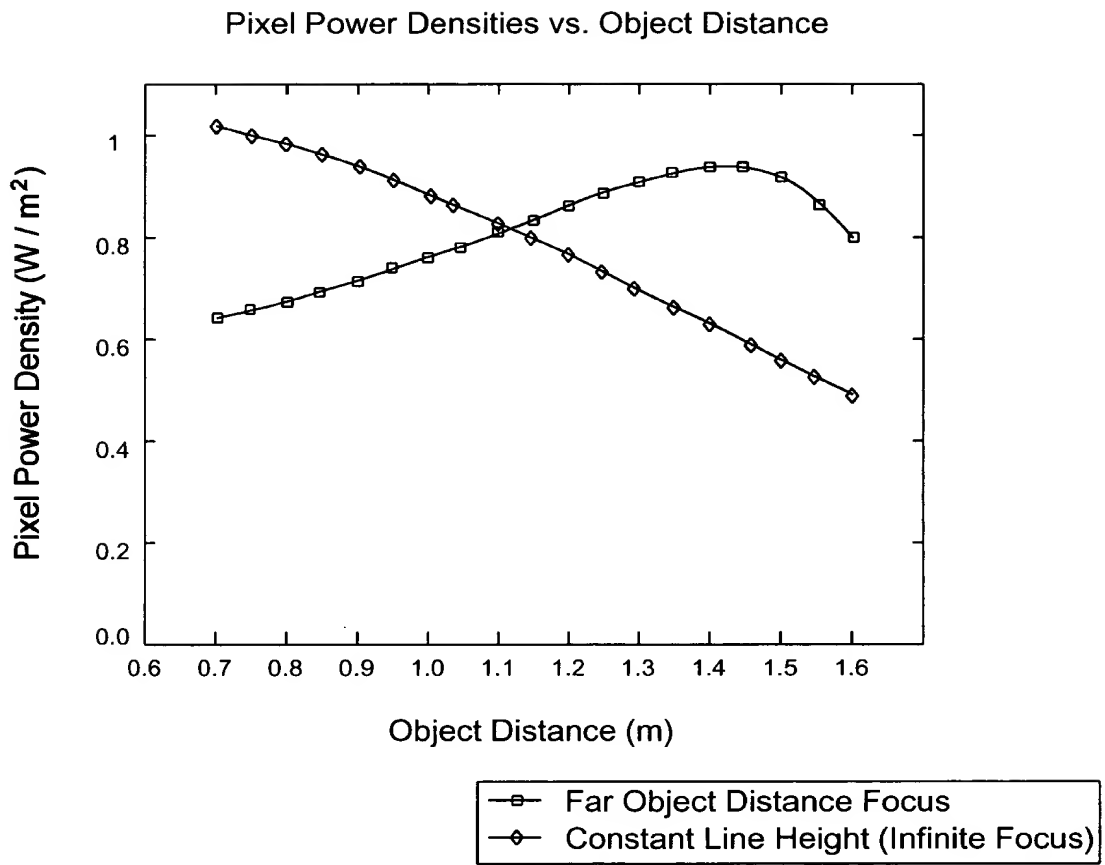


FIG. 10

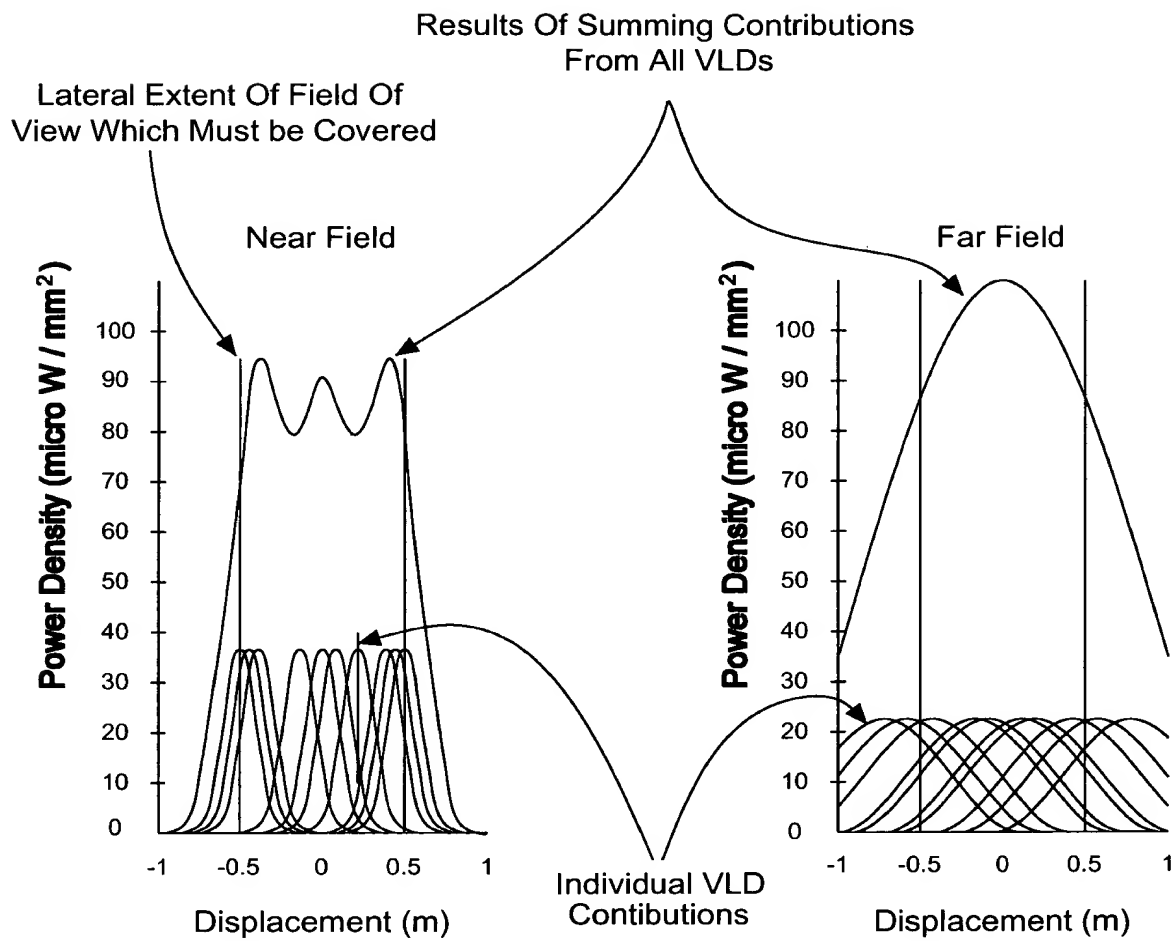


FIG. 1P1

FIG. 1P2

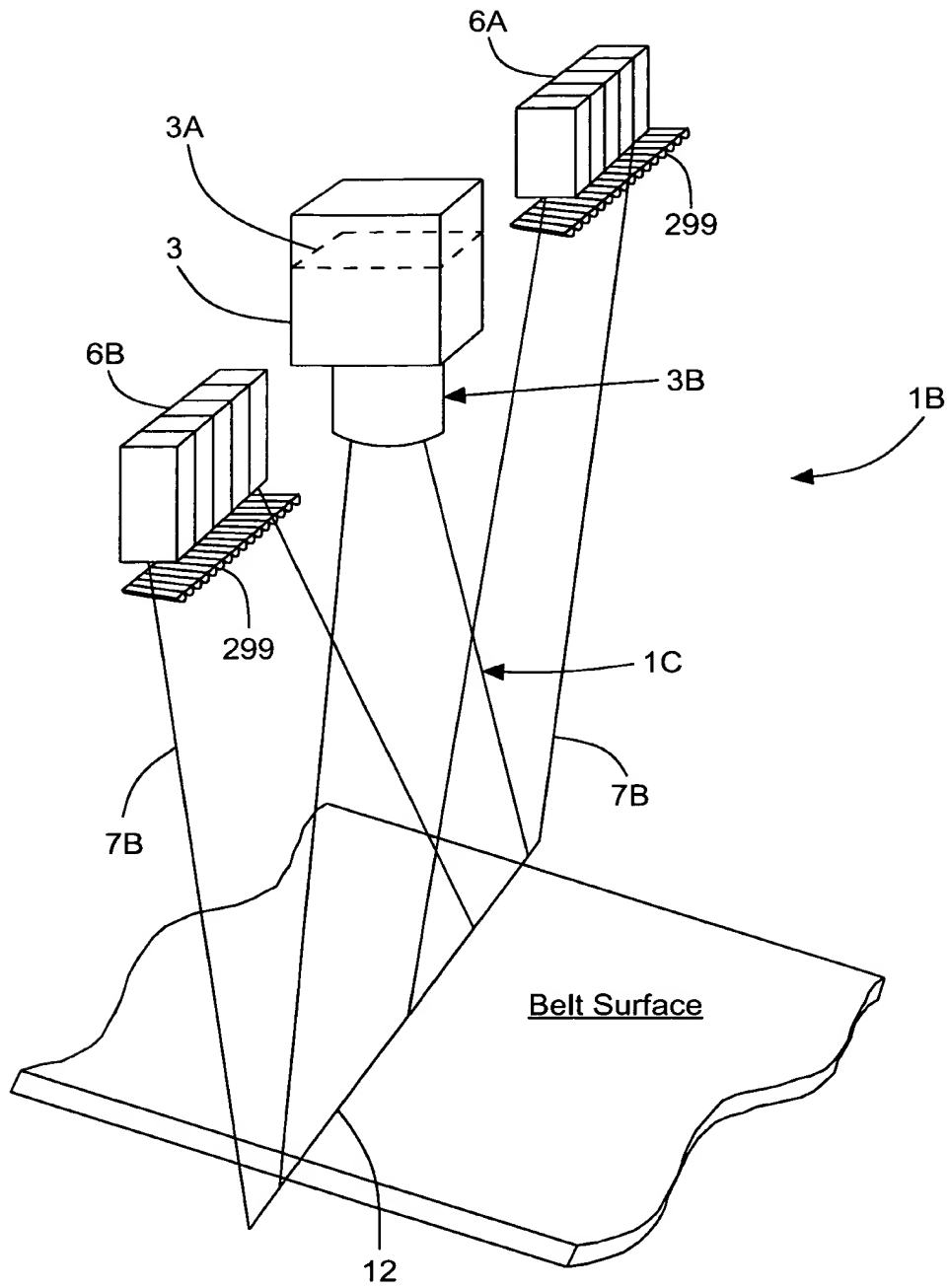


FIG. 1Q1



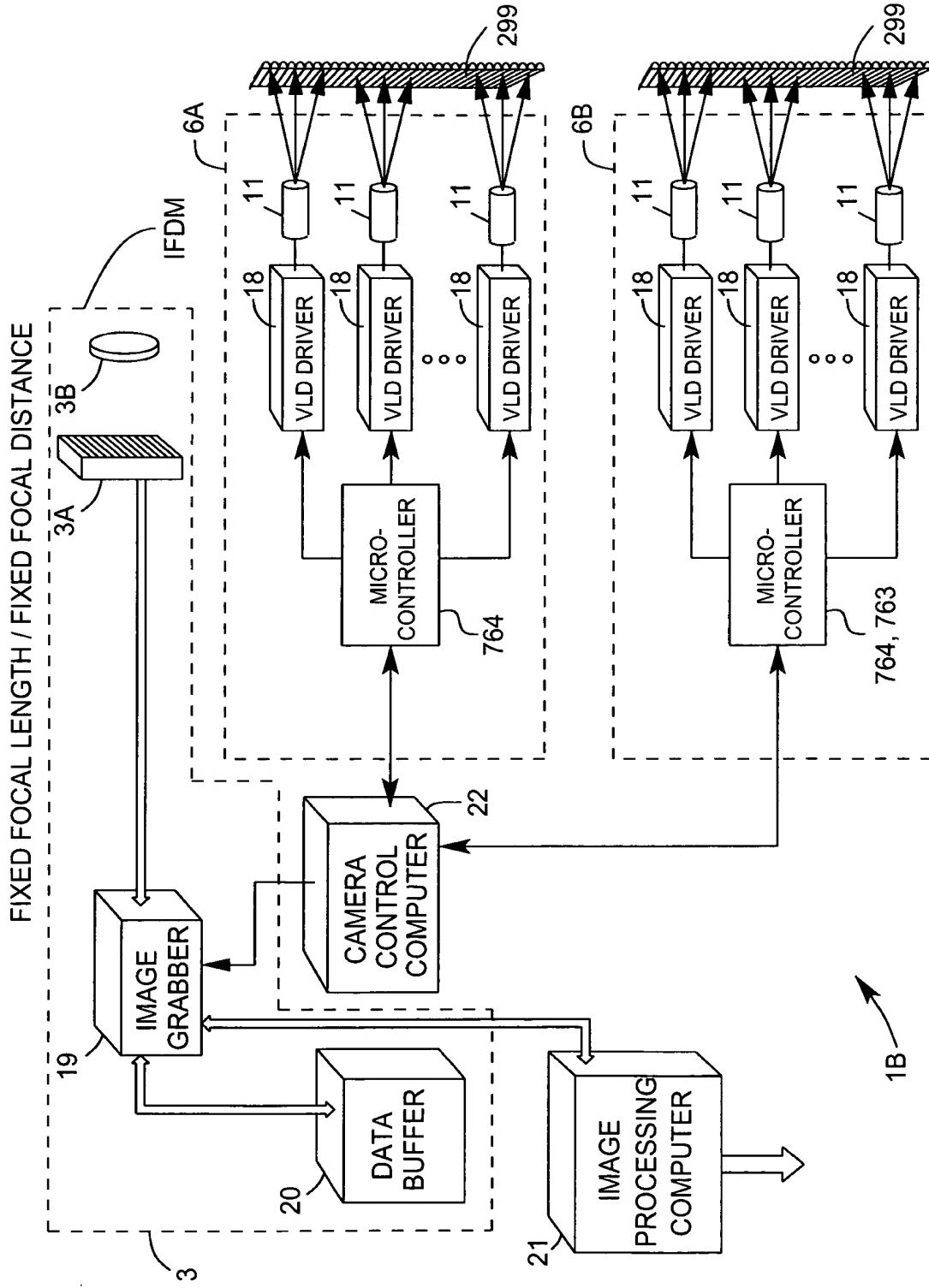
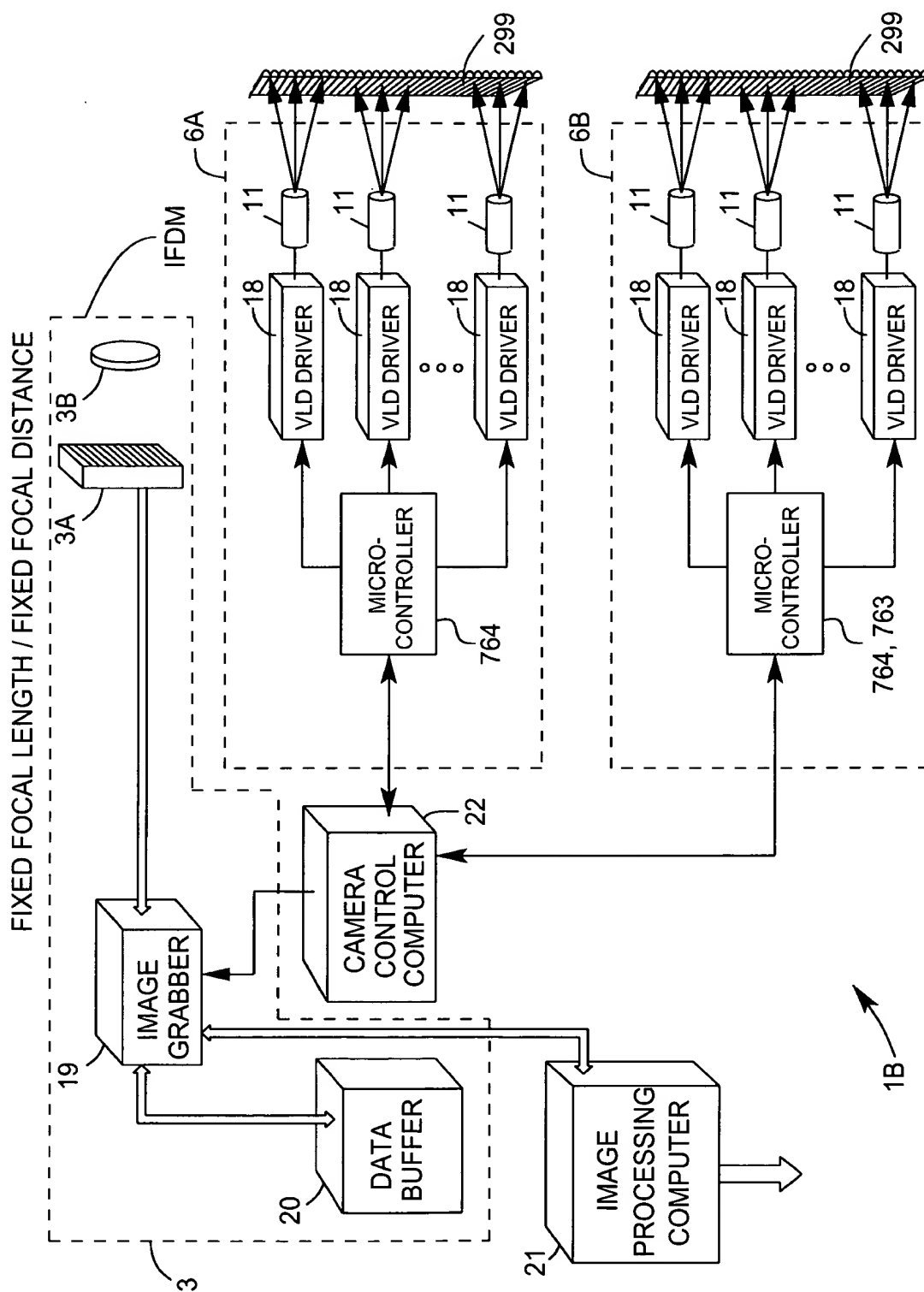


FIG. 1Q2



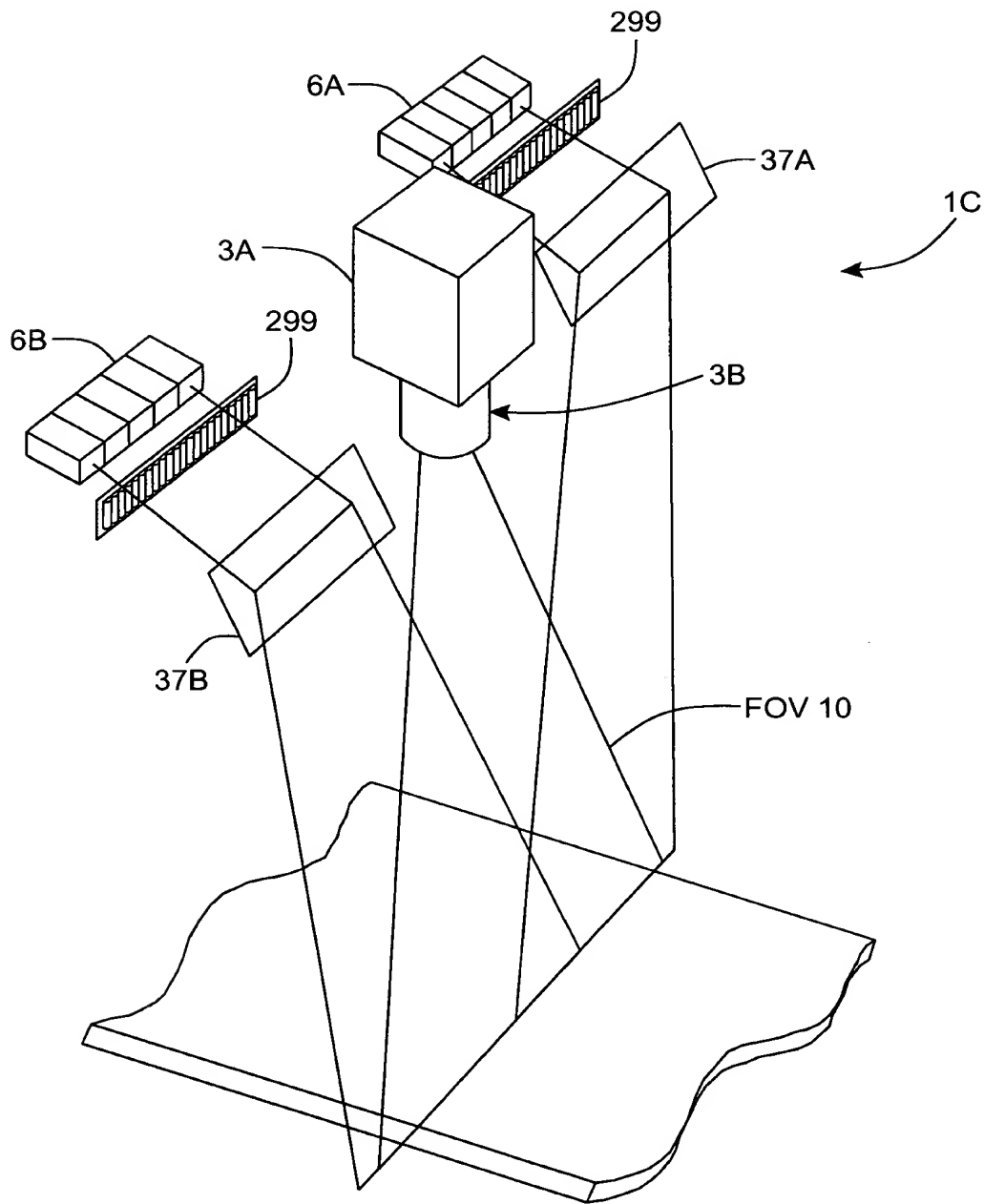


FIG. 1R1

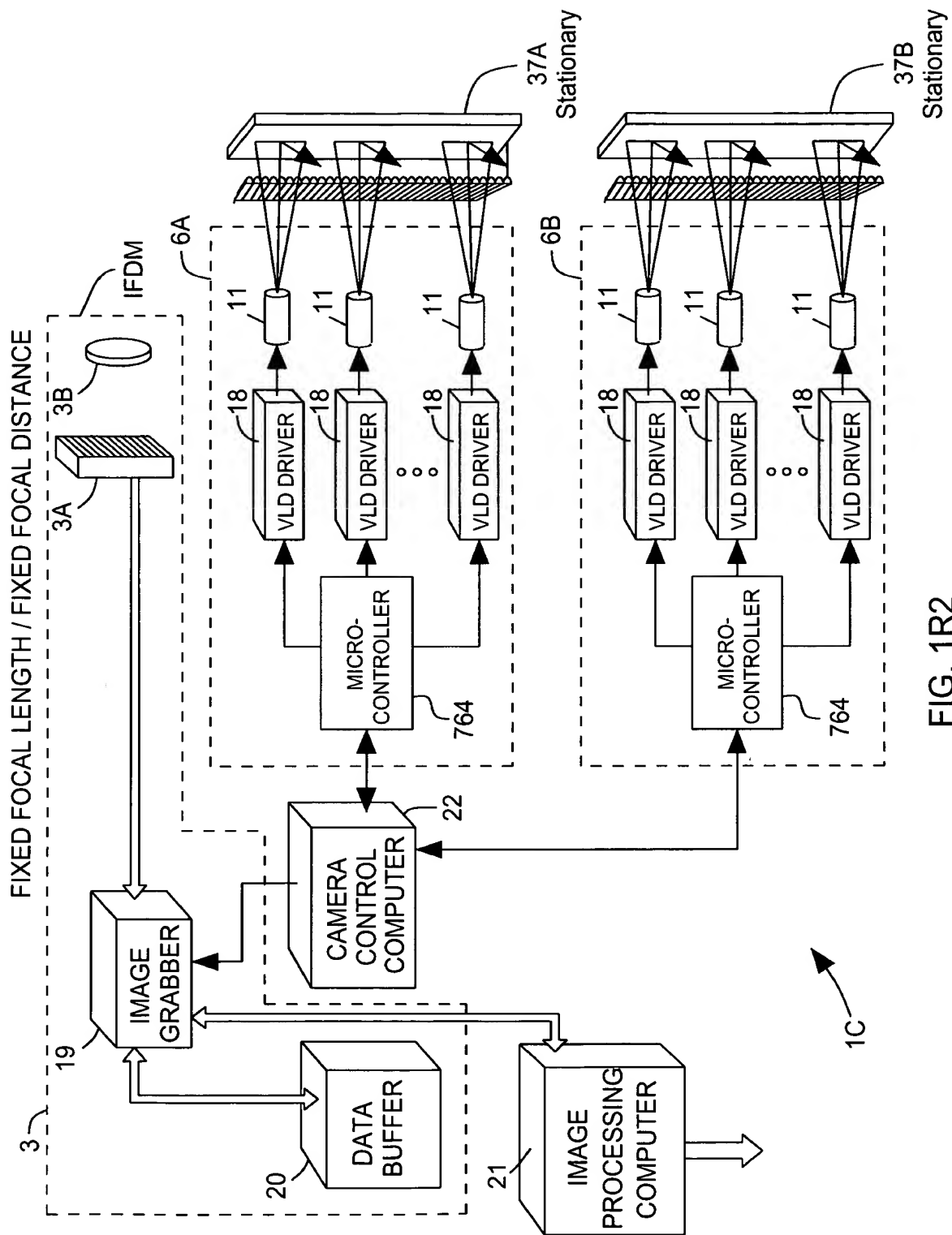


FIG. 1R2

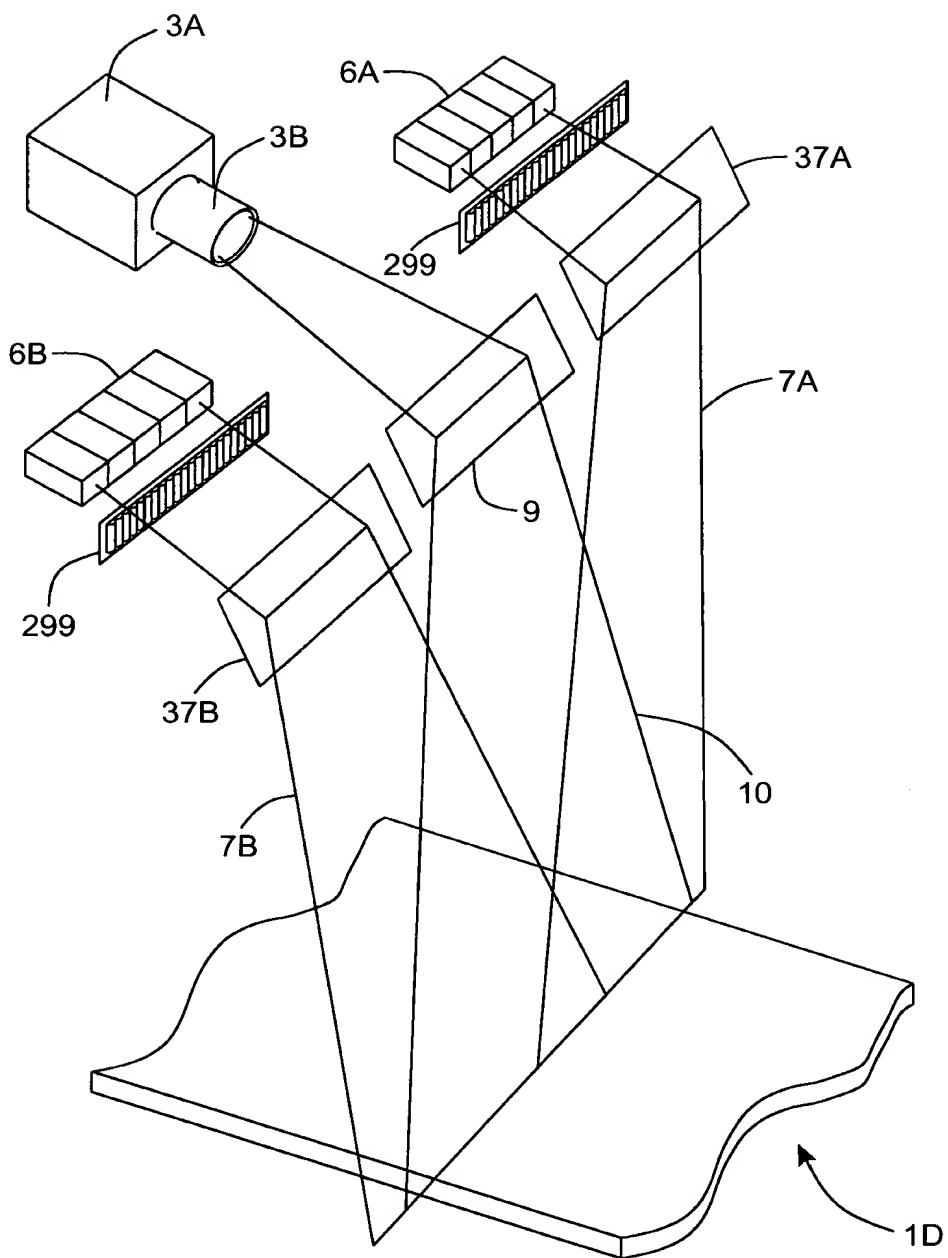
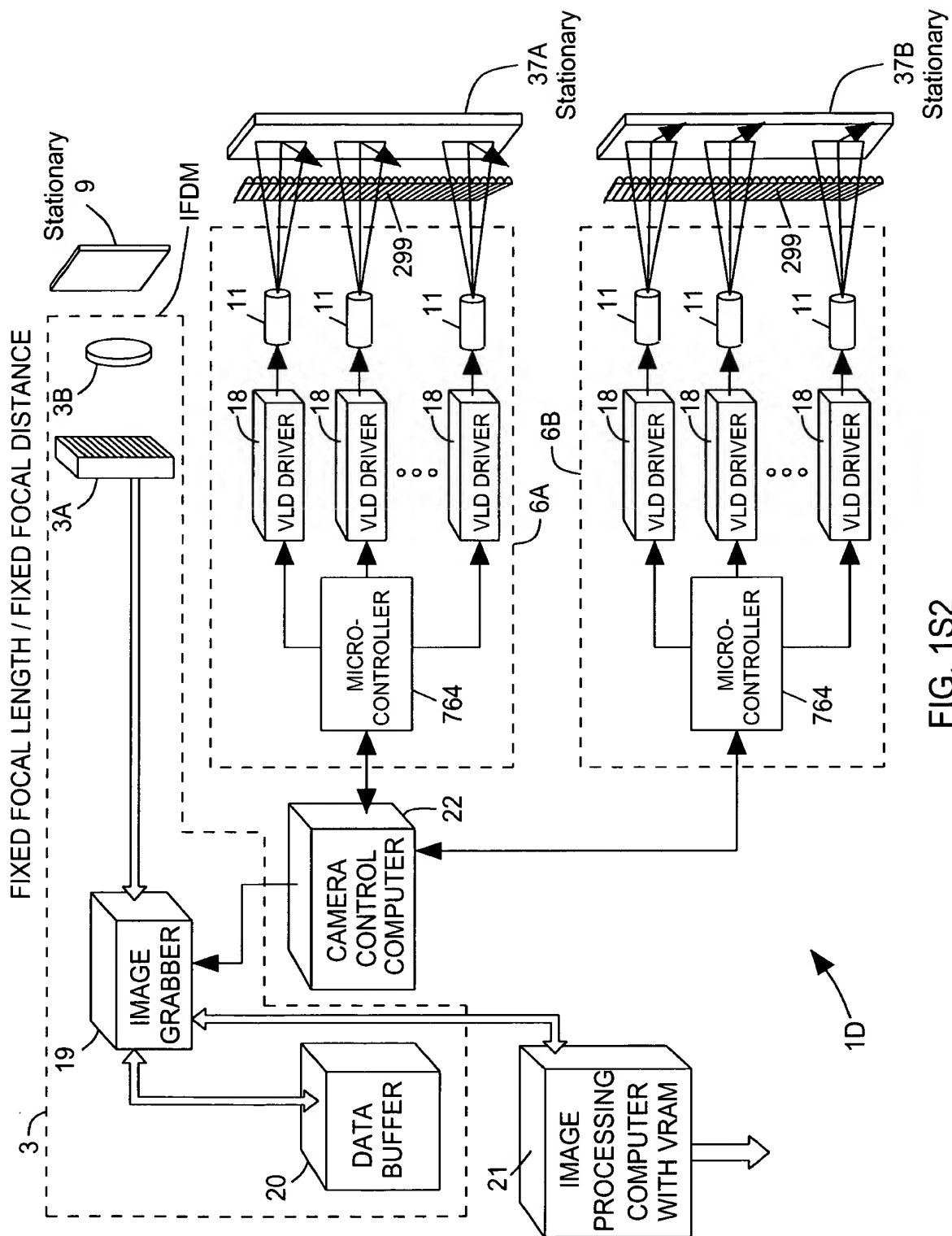


FIG. 1S1



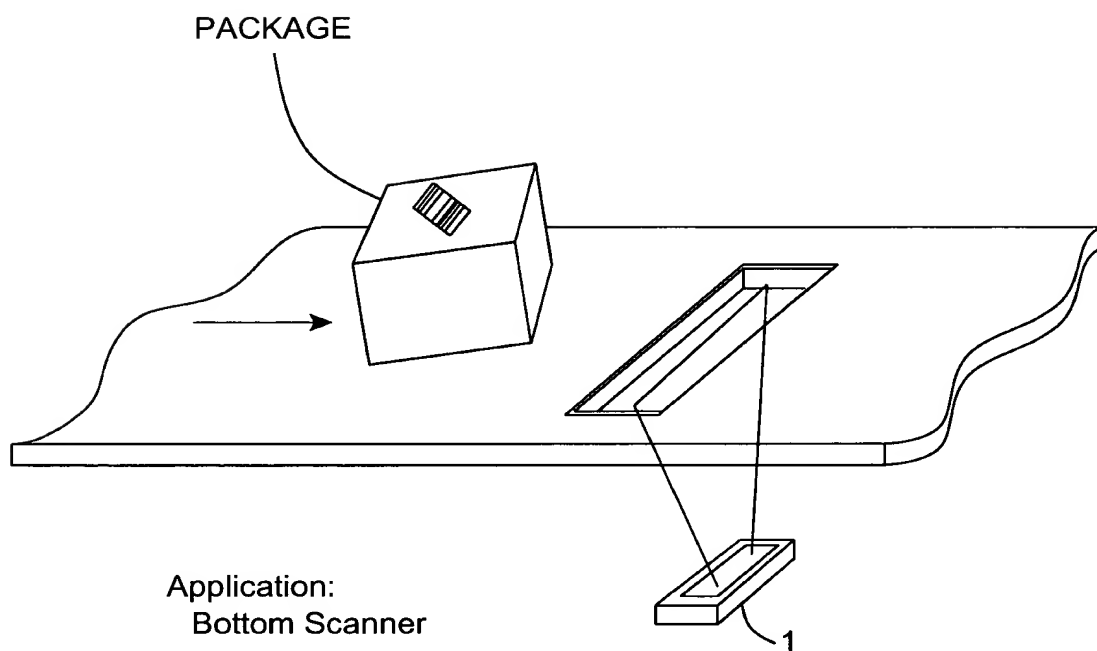
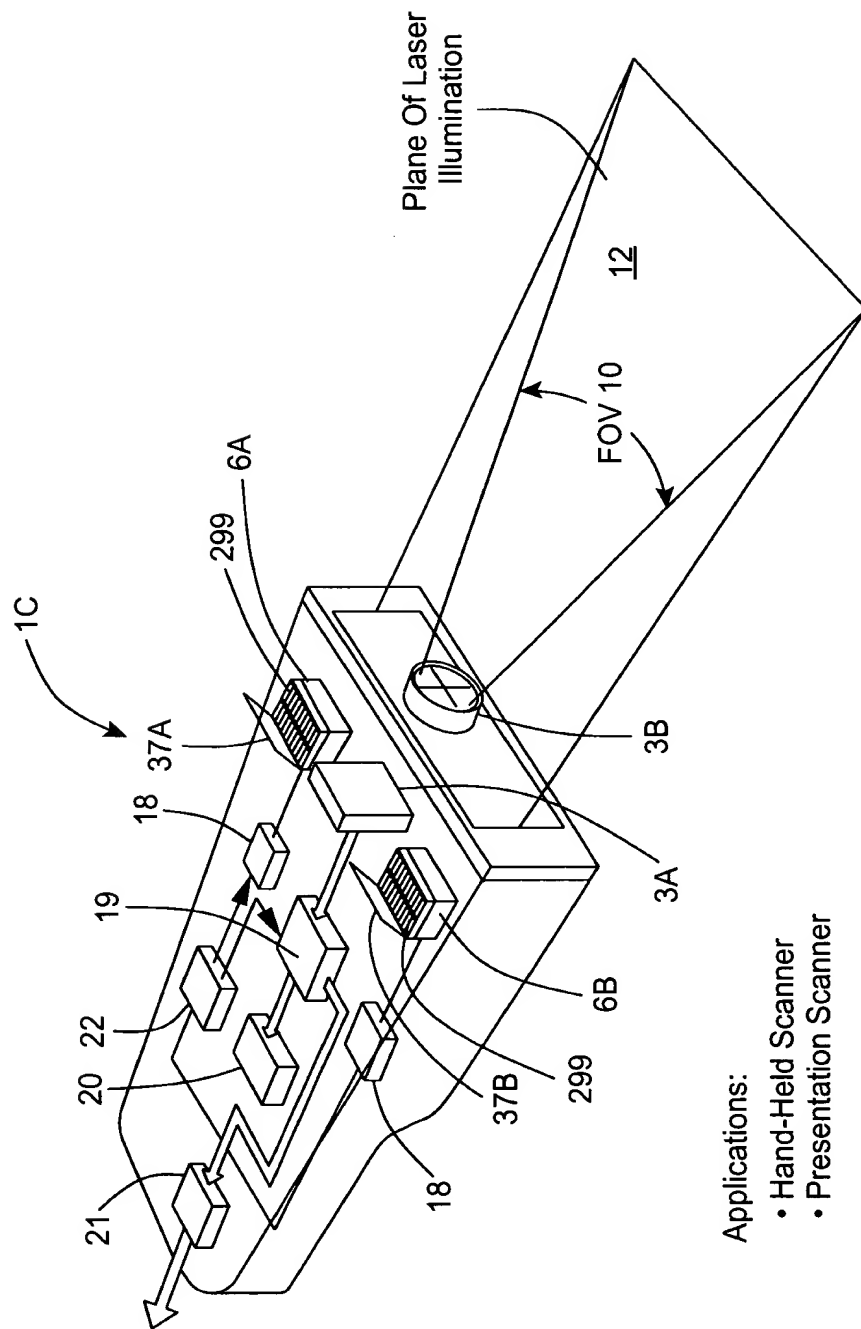


FIG. 1T





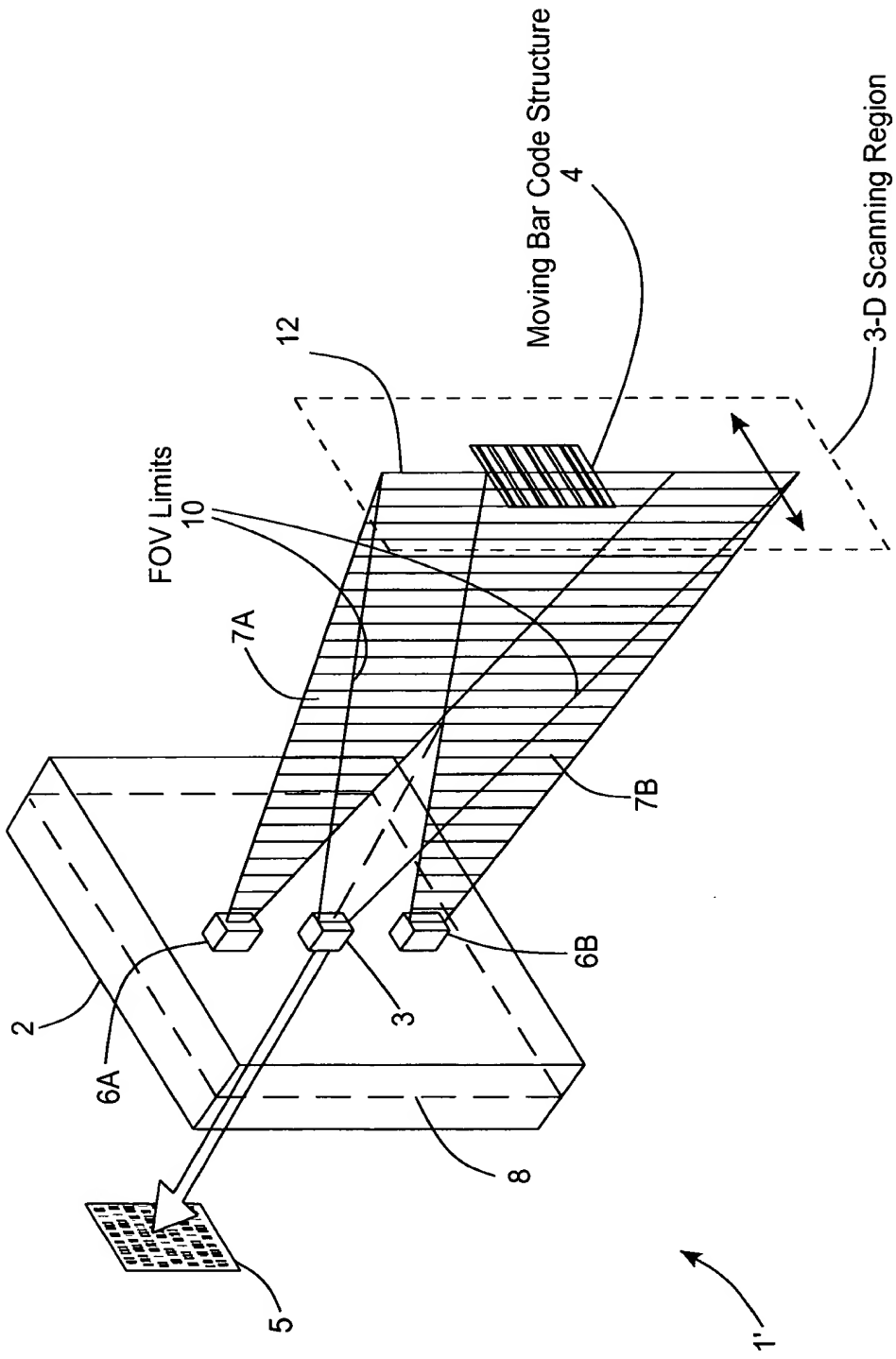
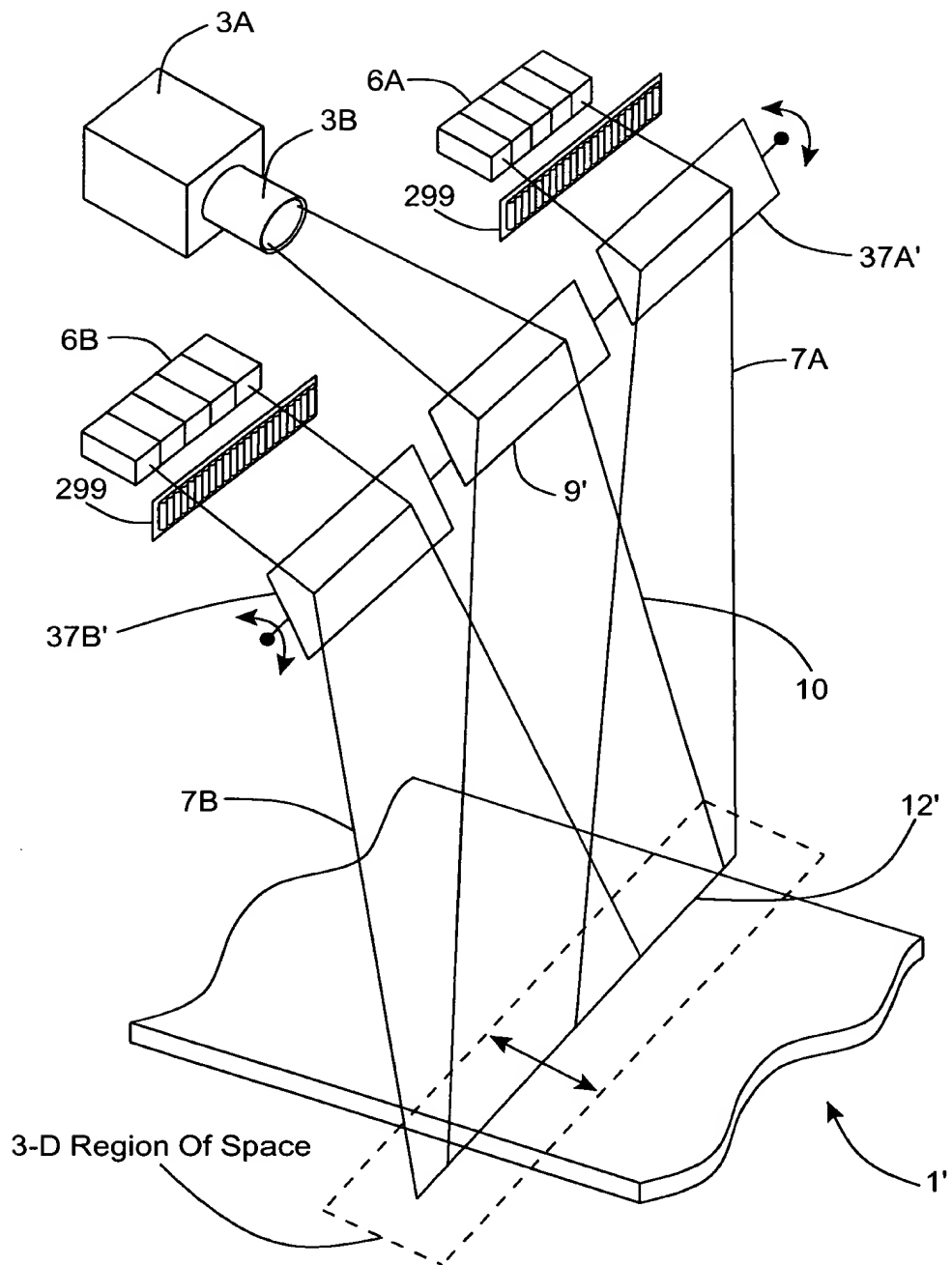


FIG. 1V1



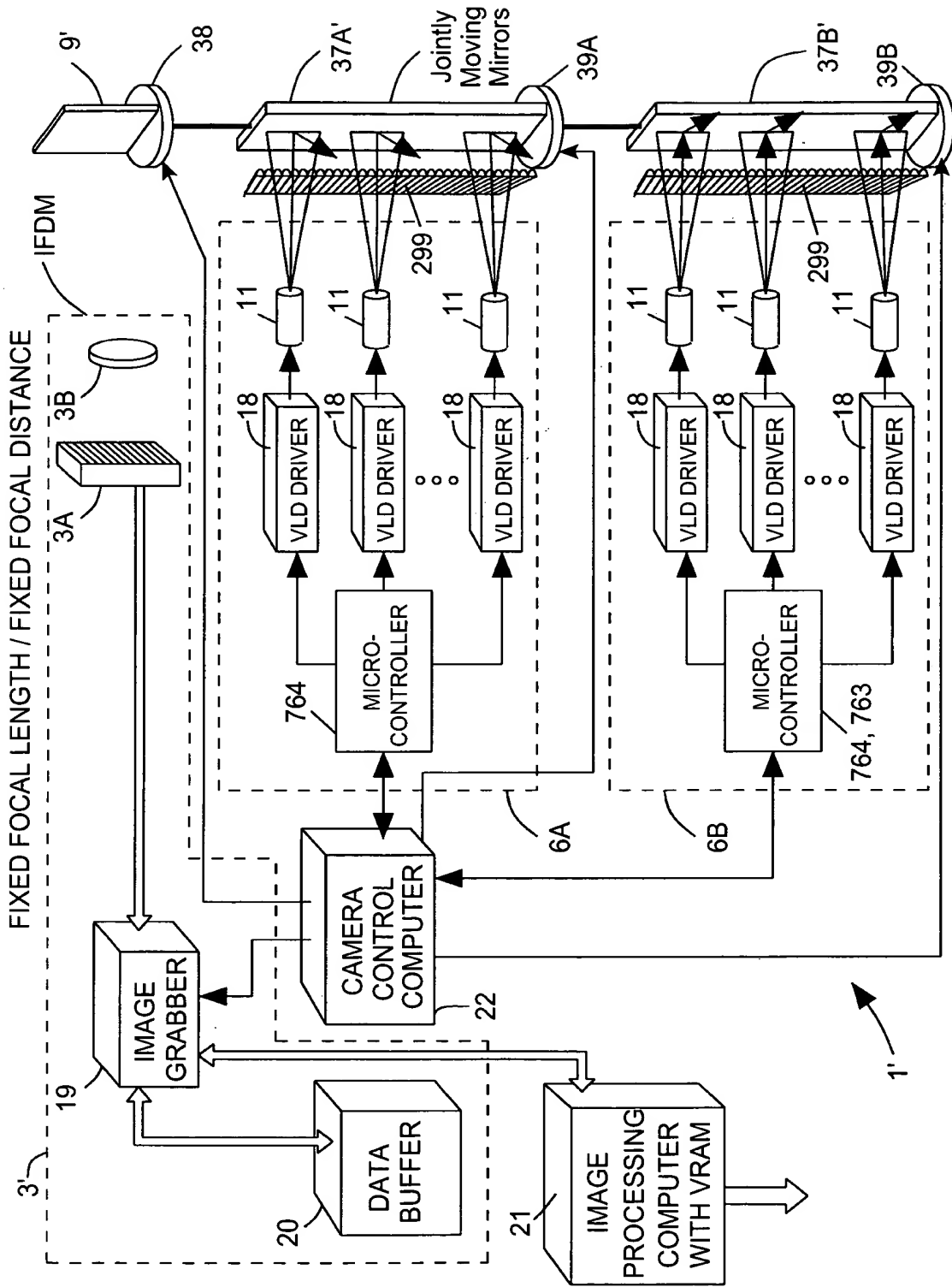
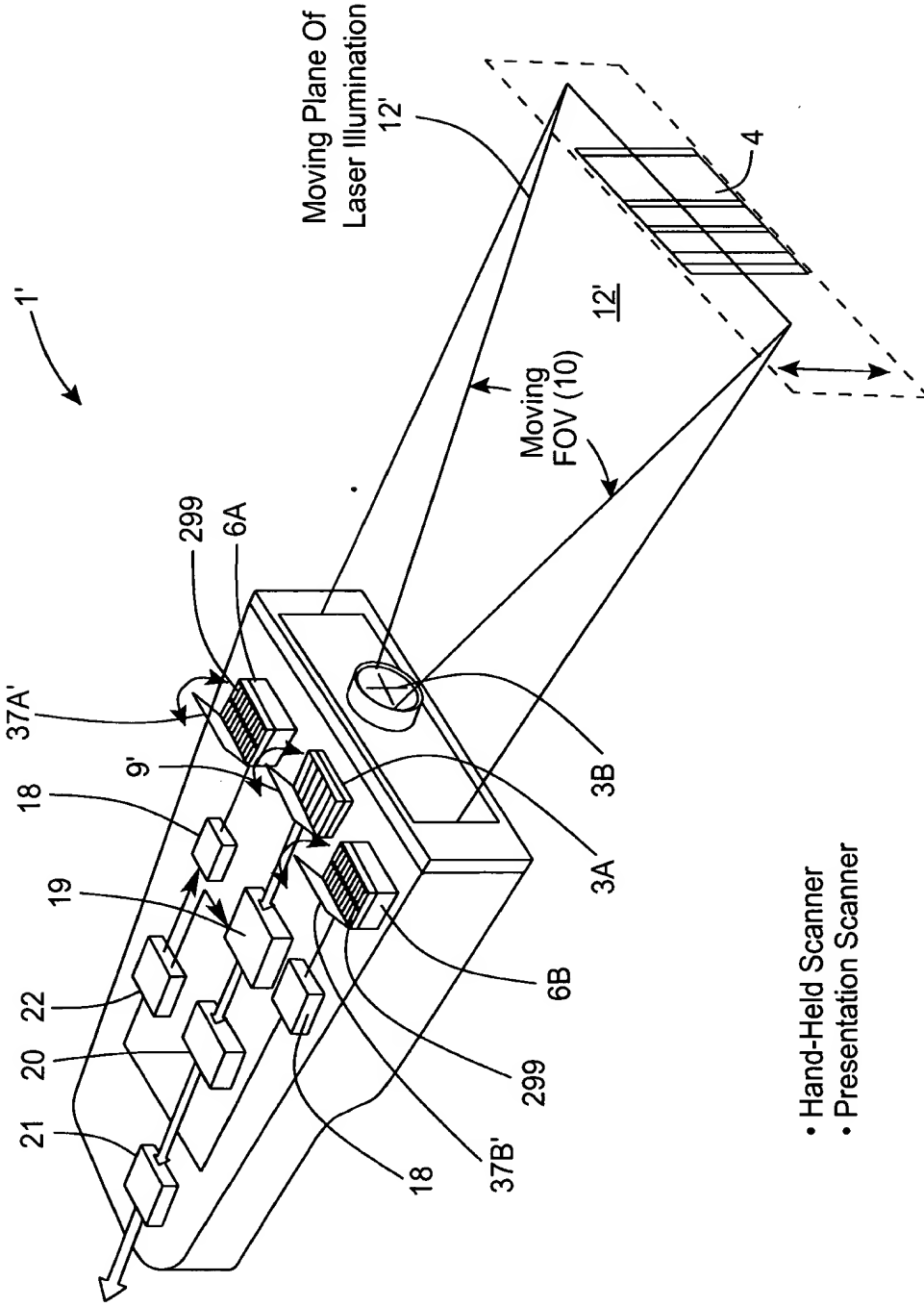


FIG. 1V3



- Hand-Held Scanner
- Presentation Scanner

FIG. 1V4

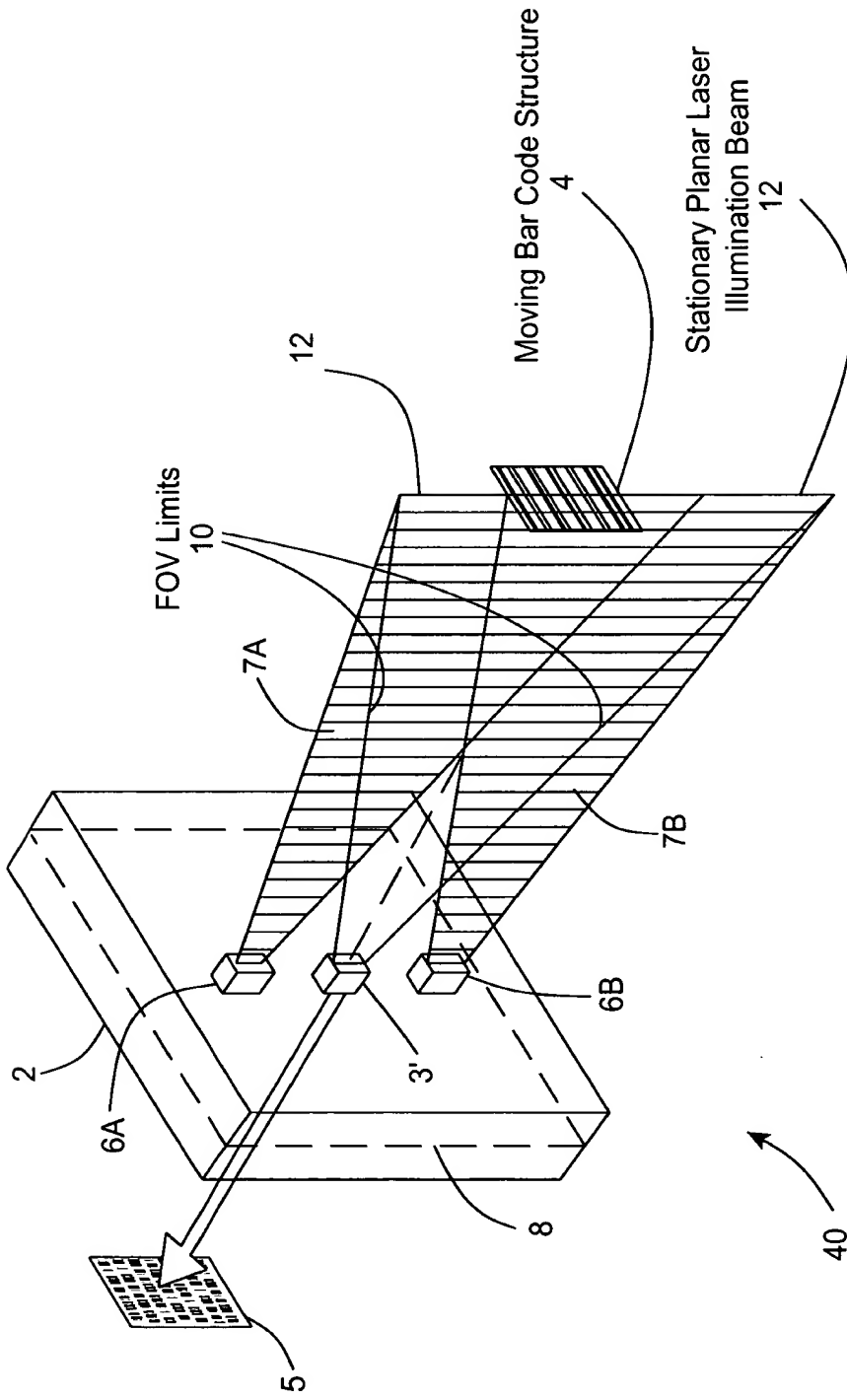


FIG. 2A

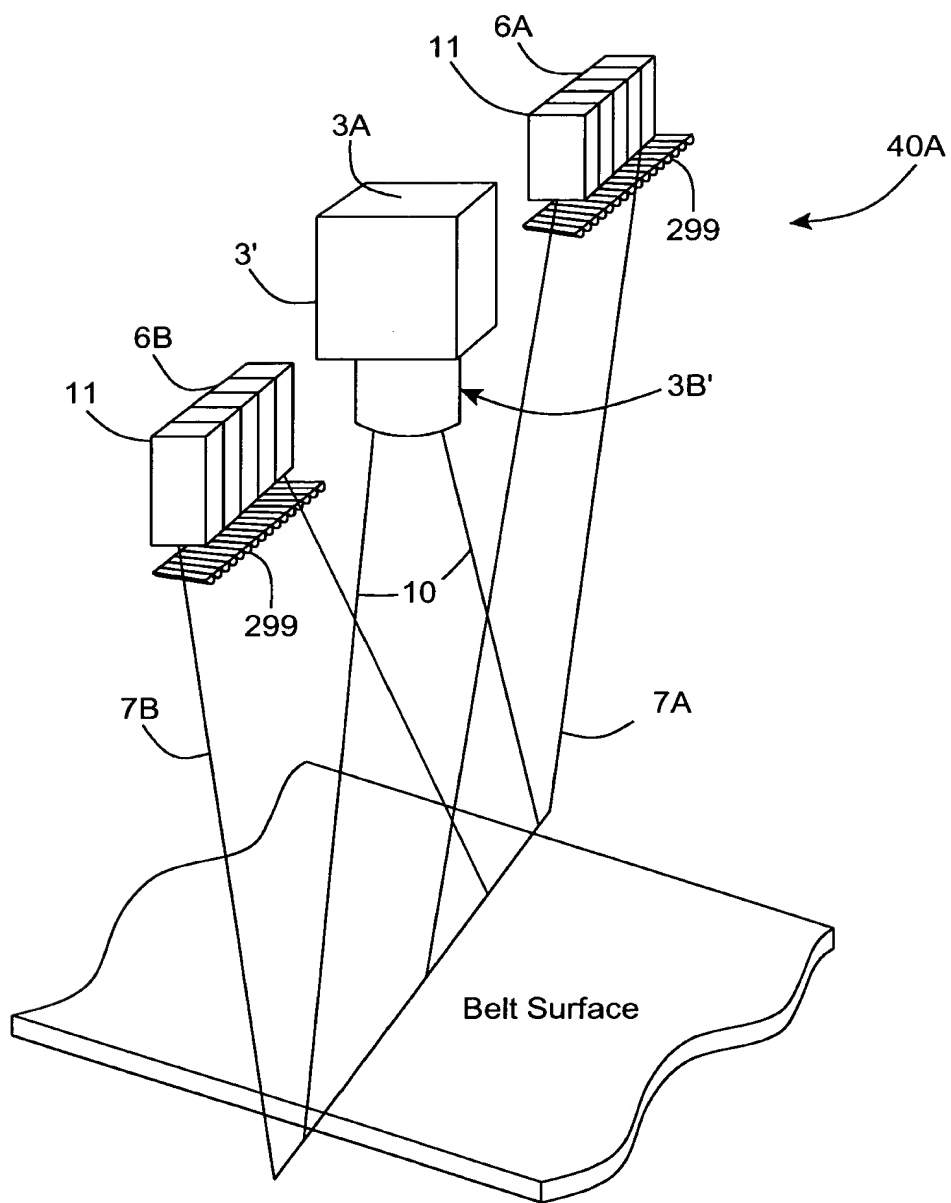


FIG. 2B1

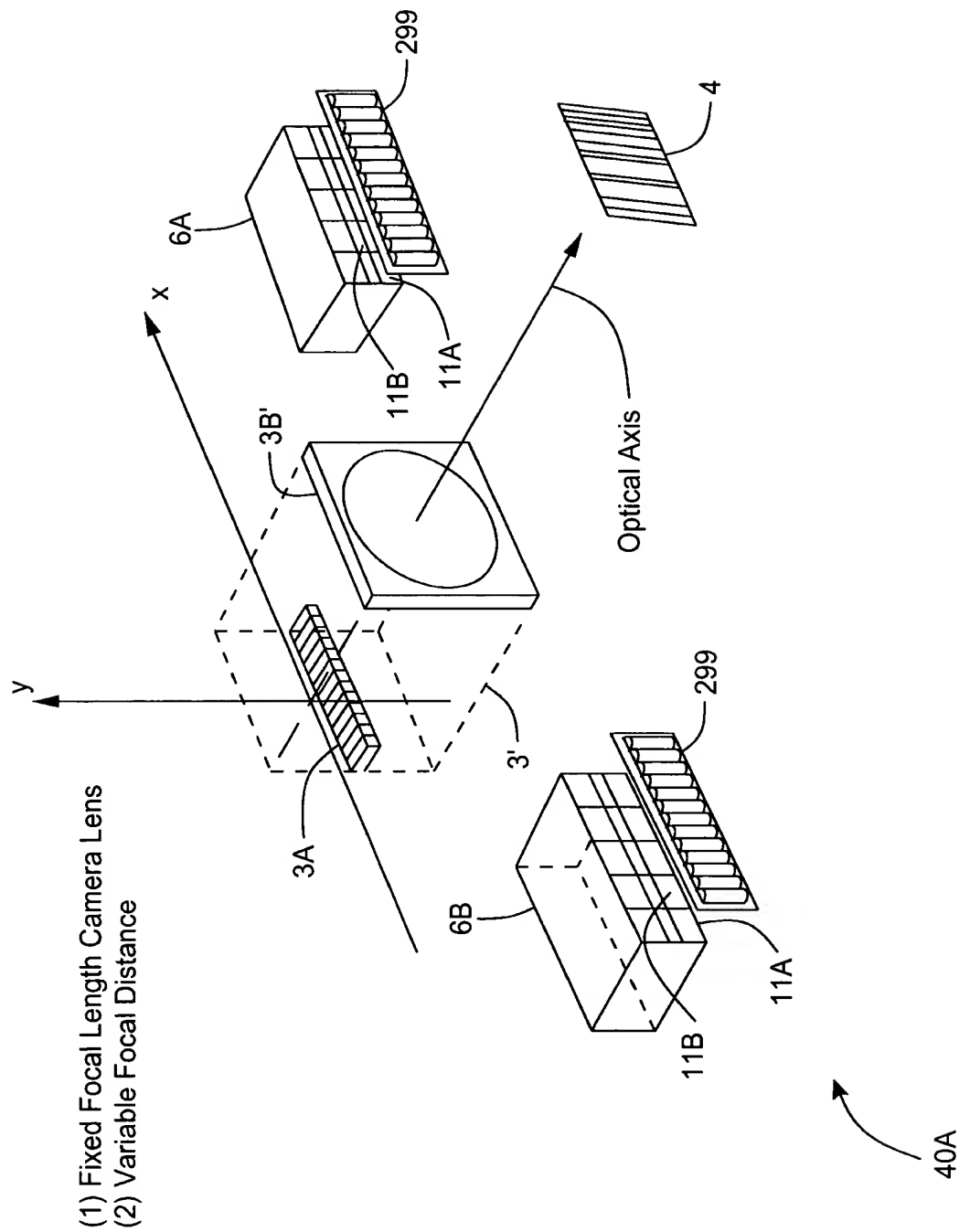


FIG. 2B2

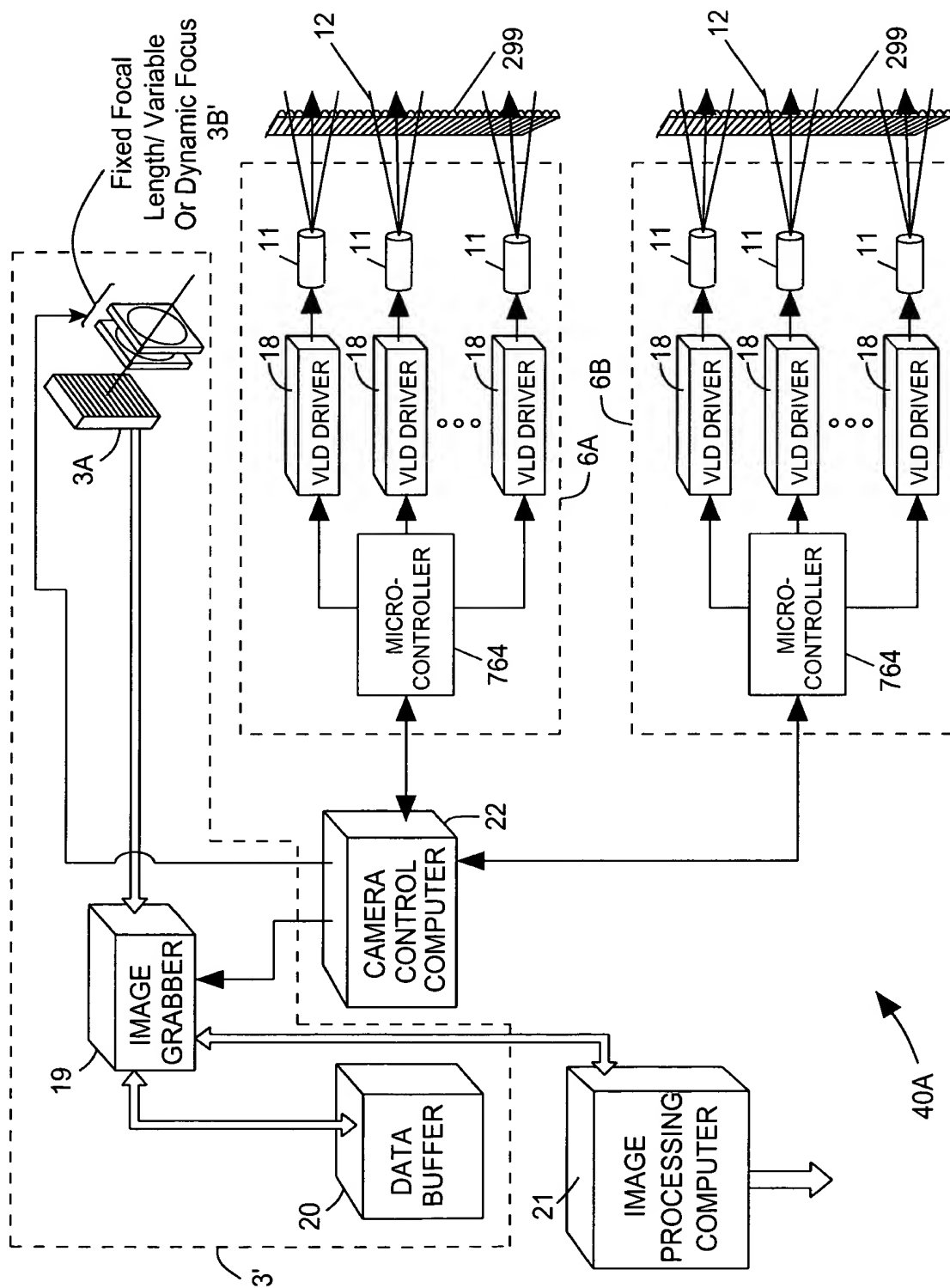


FIG. 2C1

40A



- Fixed Focal Length Imaging Lens
- Variable Or Dynamic Focus Control

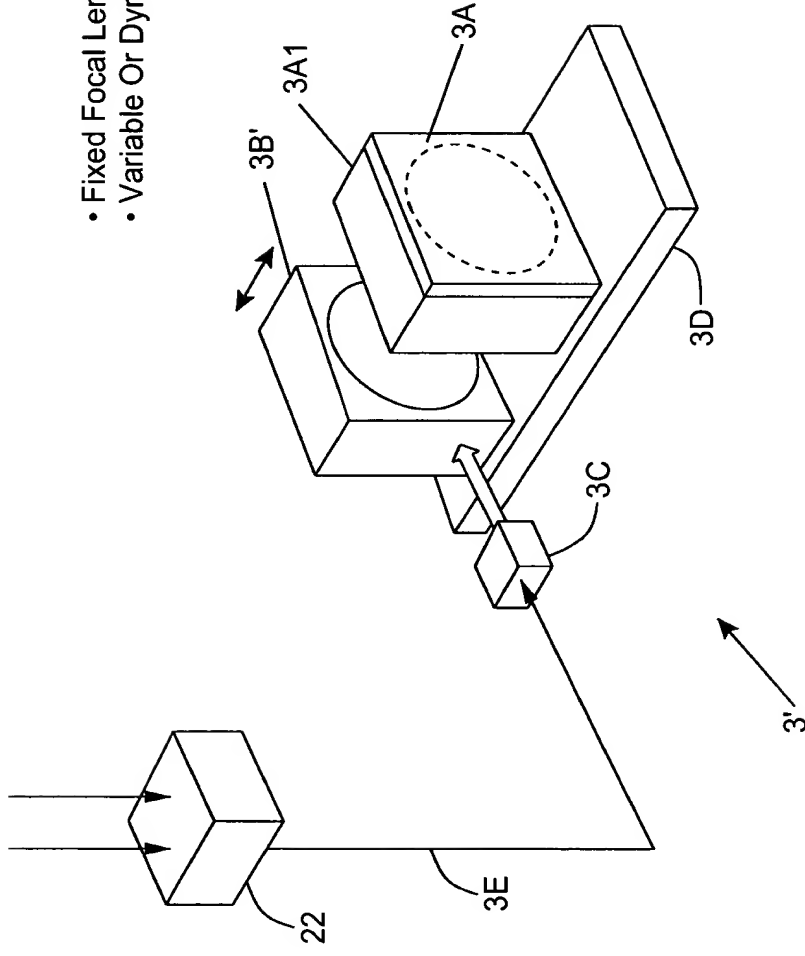


FIG. 2C2

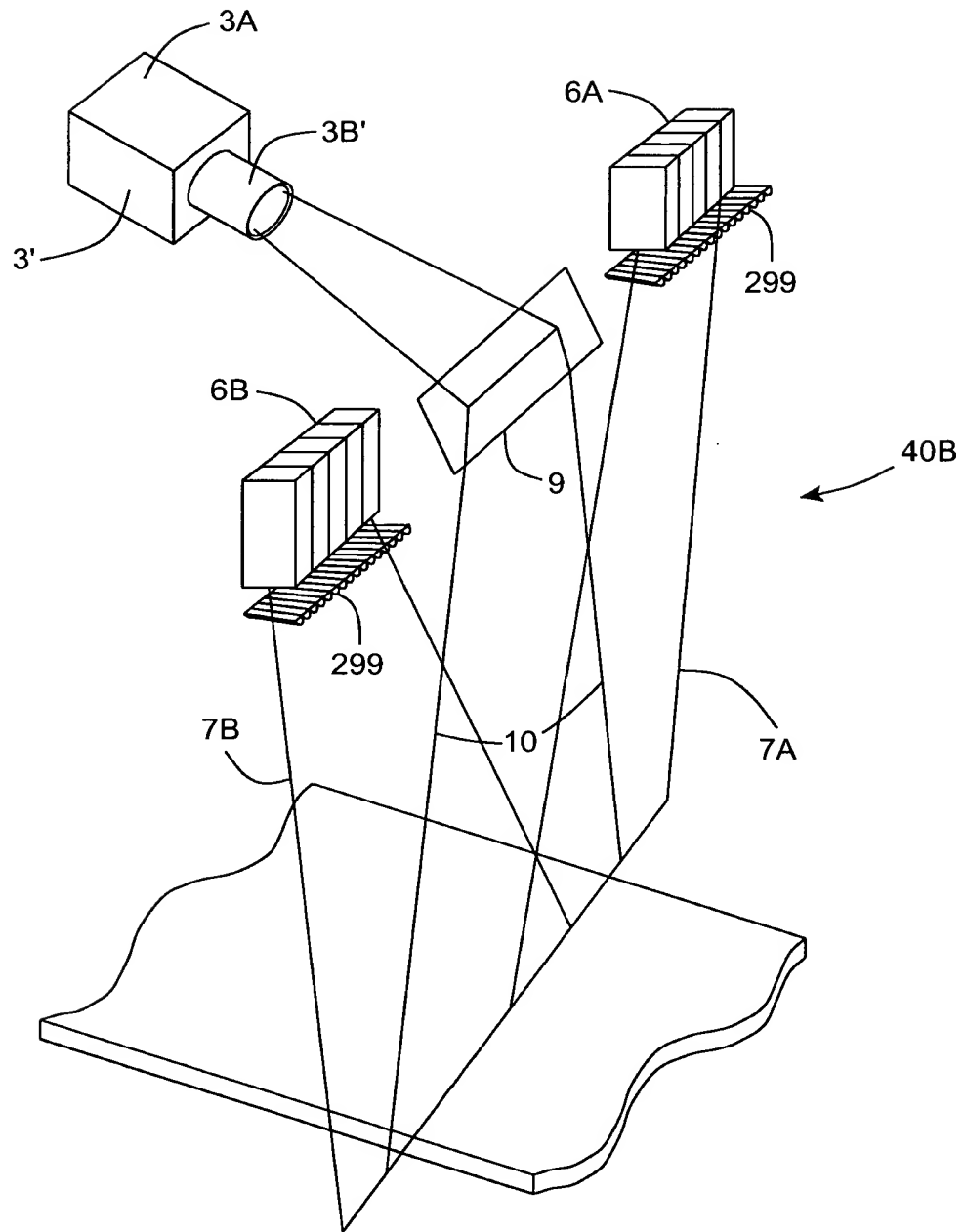


FIG. 2D1

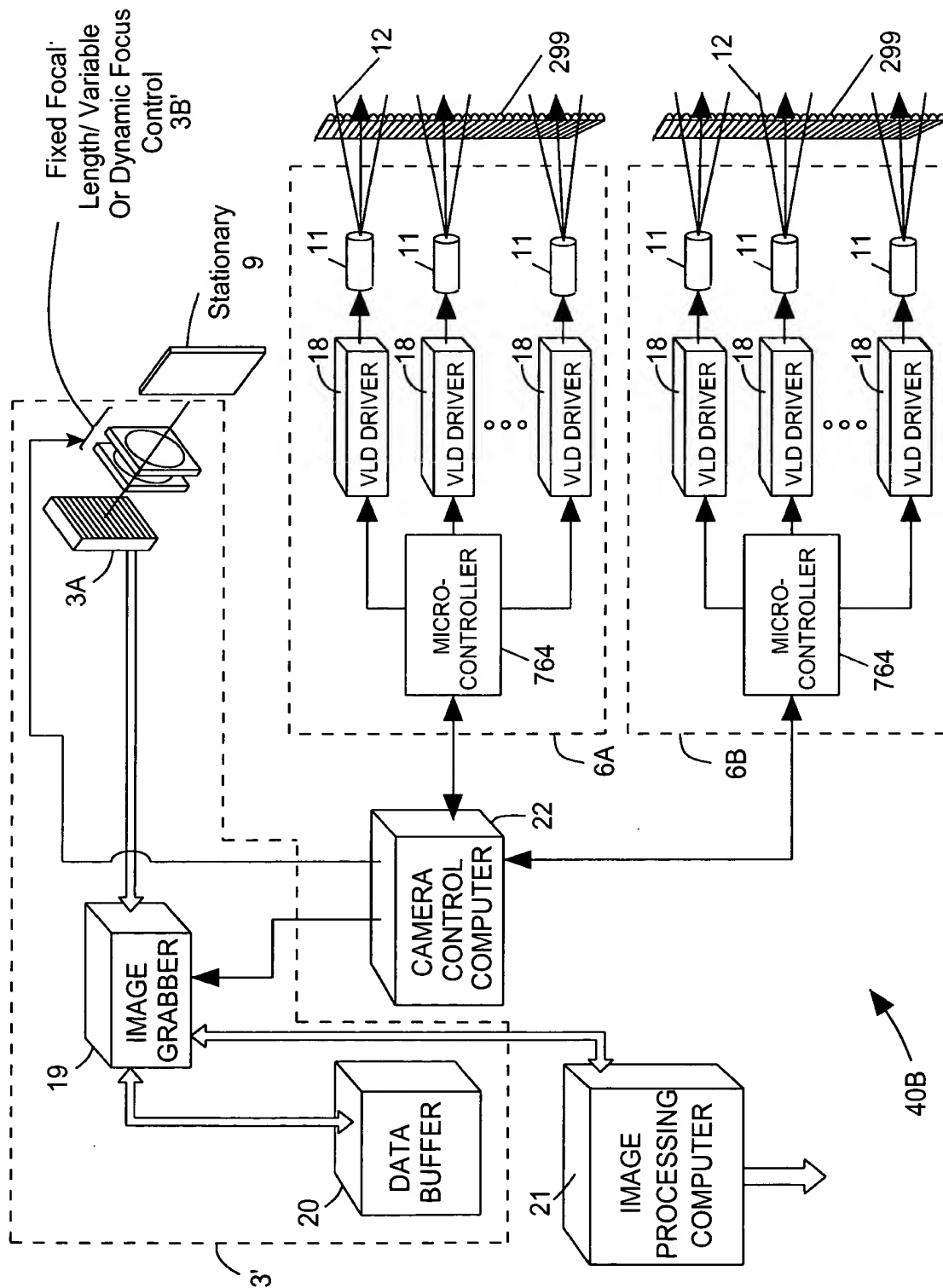


FIG. 2D2

- Fixed Focal Length Imaging Lens
- Variable Or Dynamic Focus Control

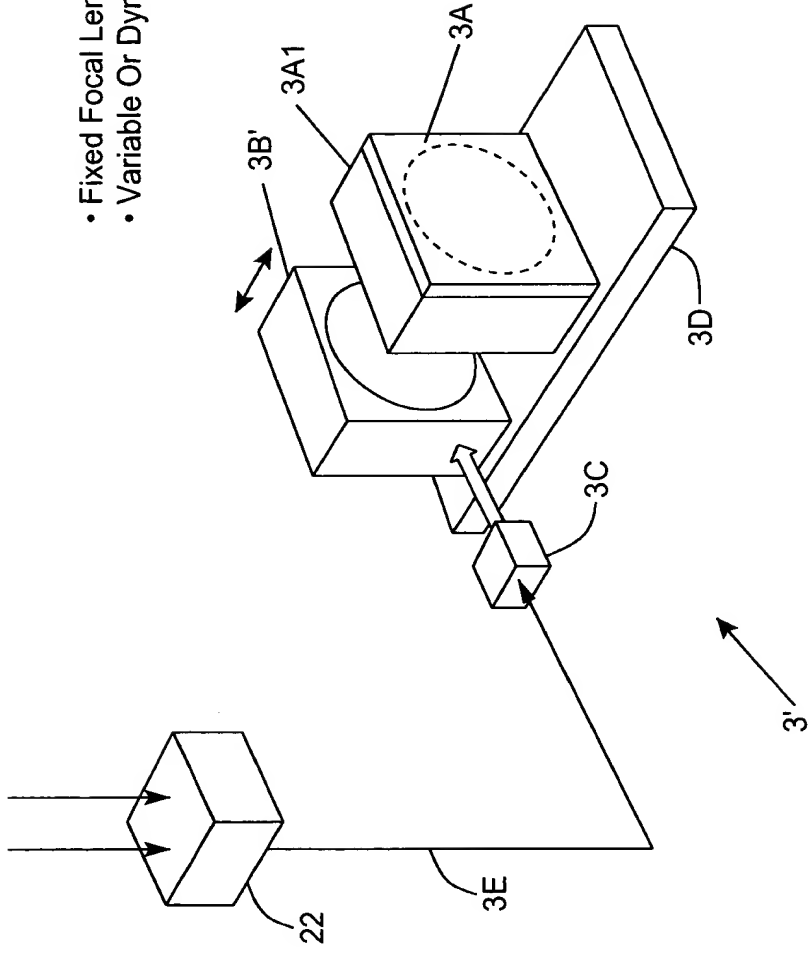


FIG. 2D3

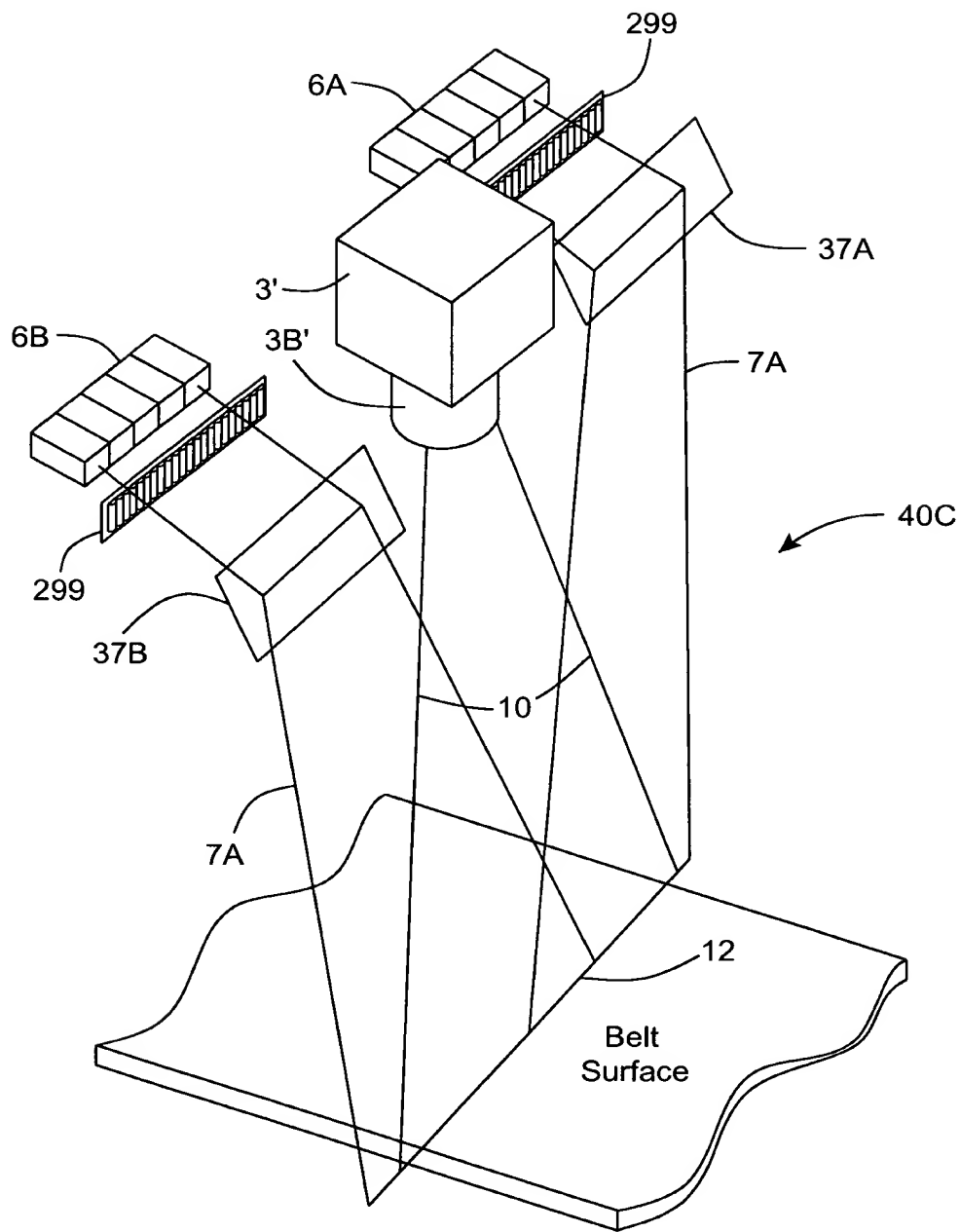


FIG. 2E1

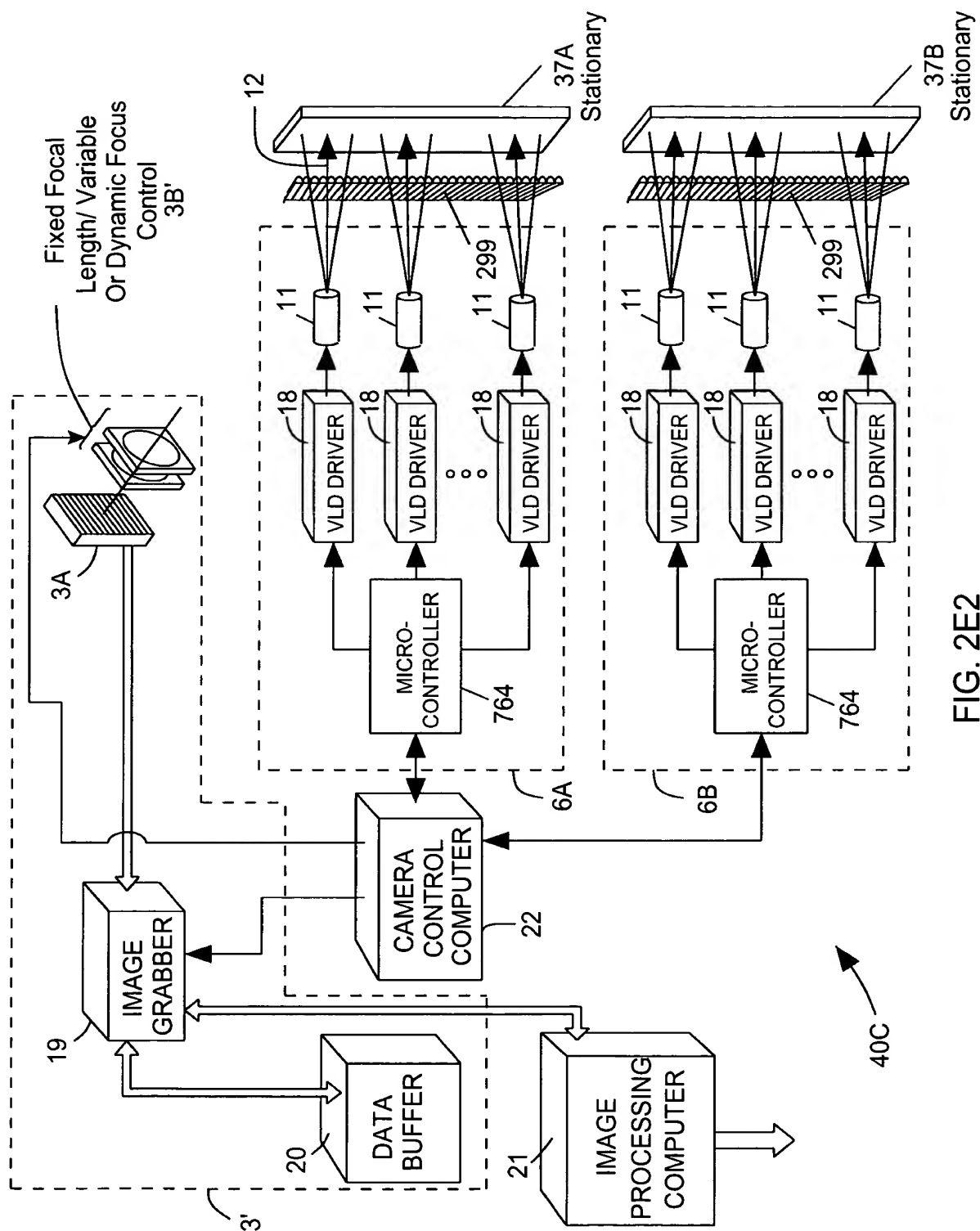


FIG. 2E2

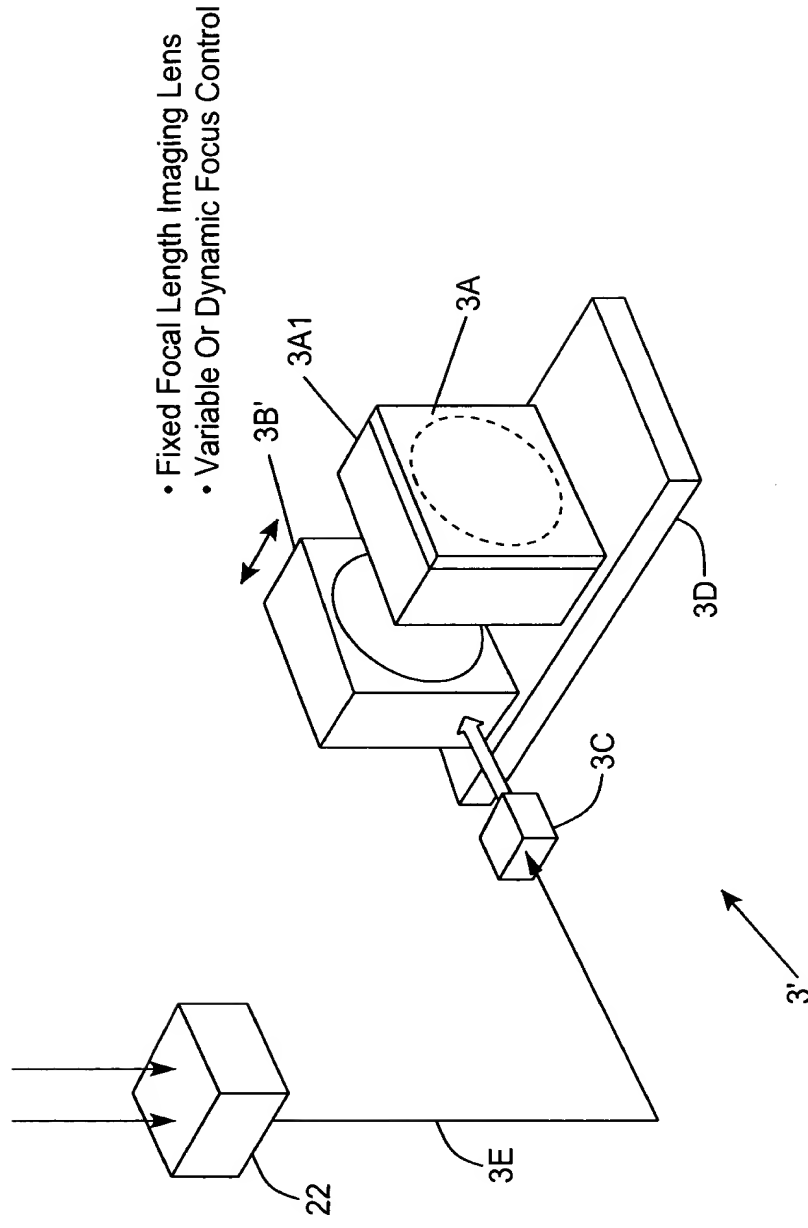


FIG. 2E3

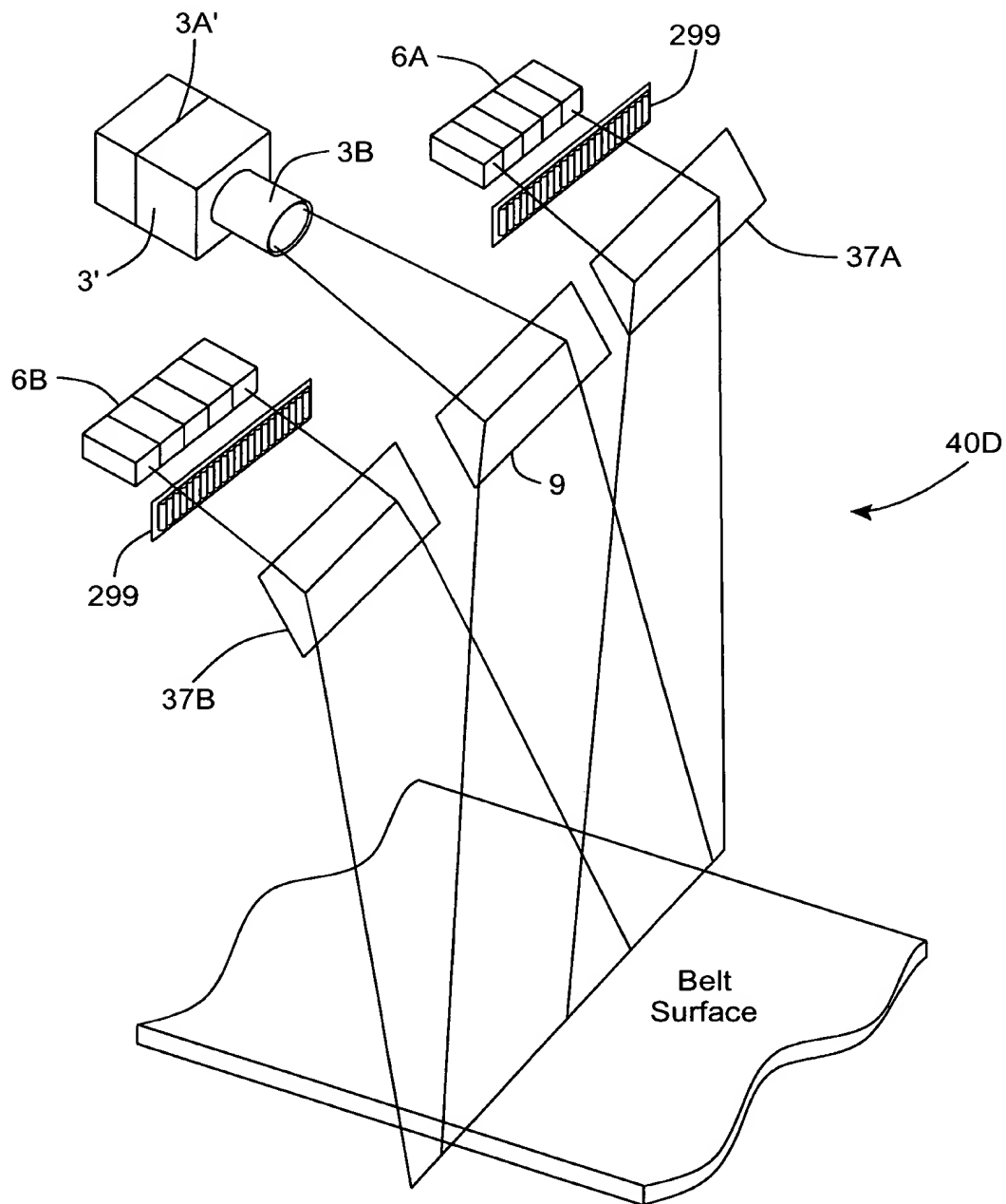


FIG. 2F1



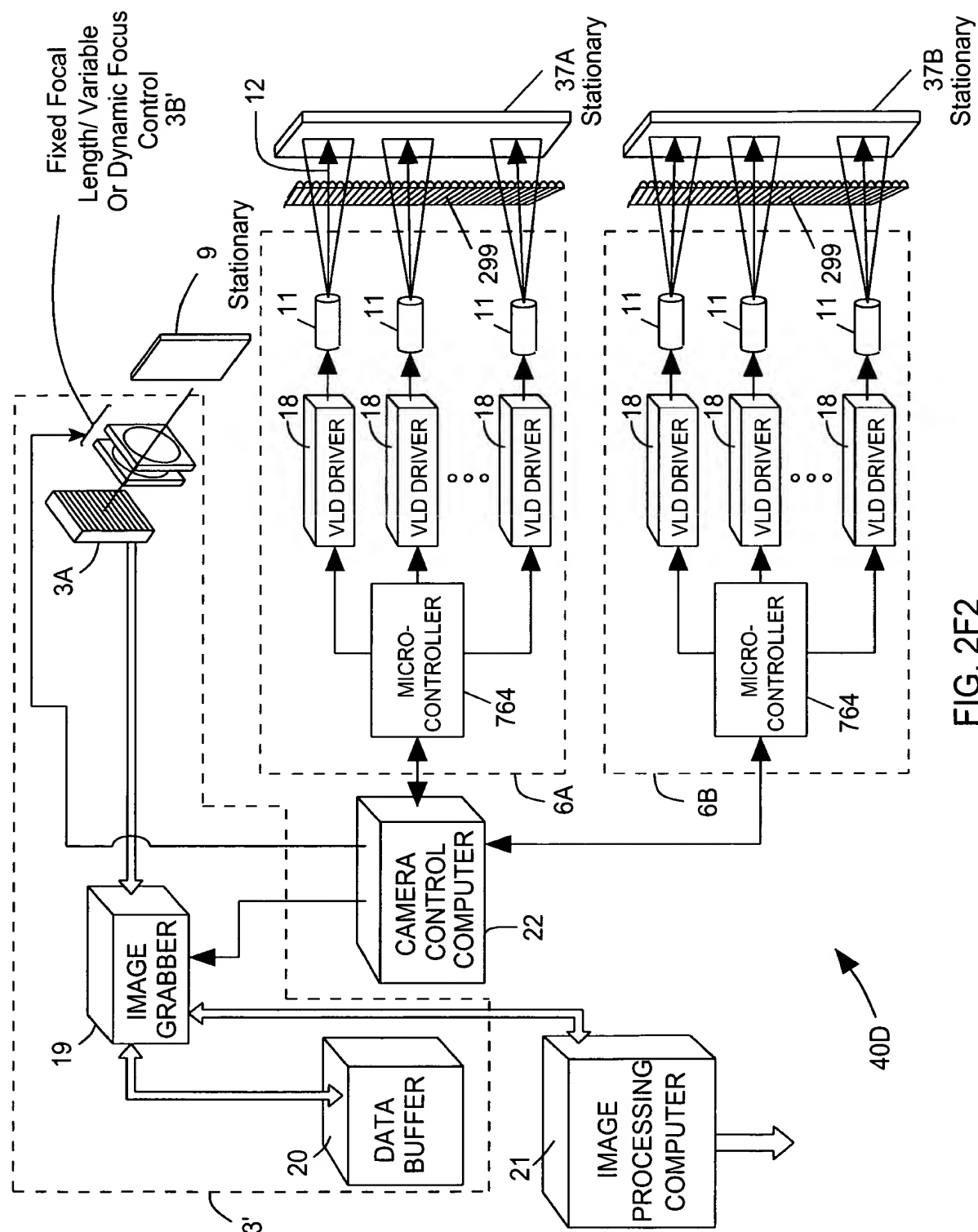


FIG. 2F2

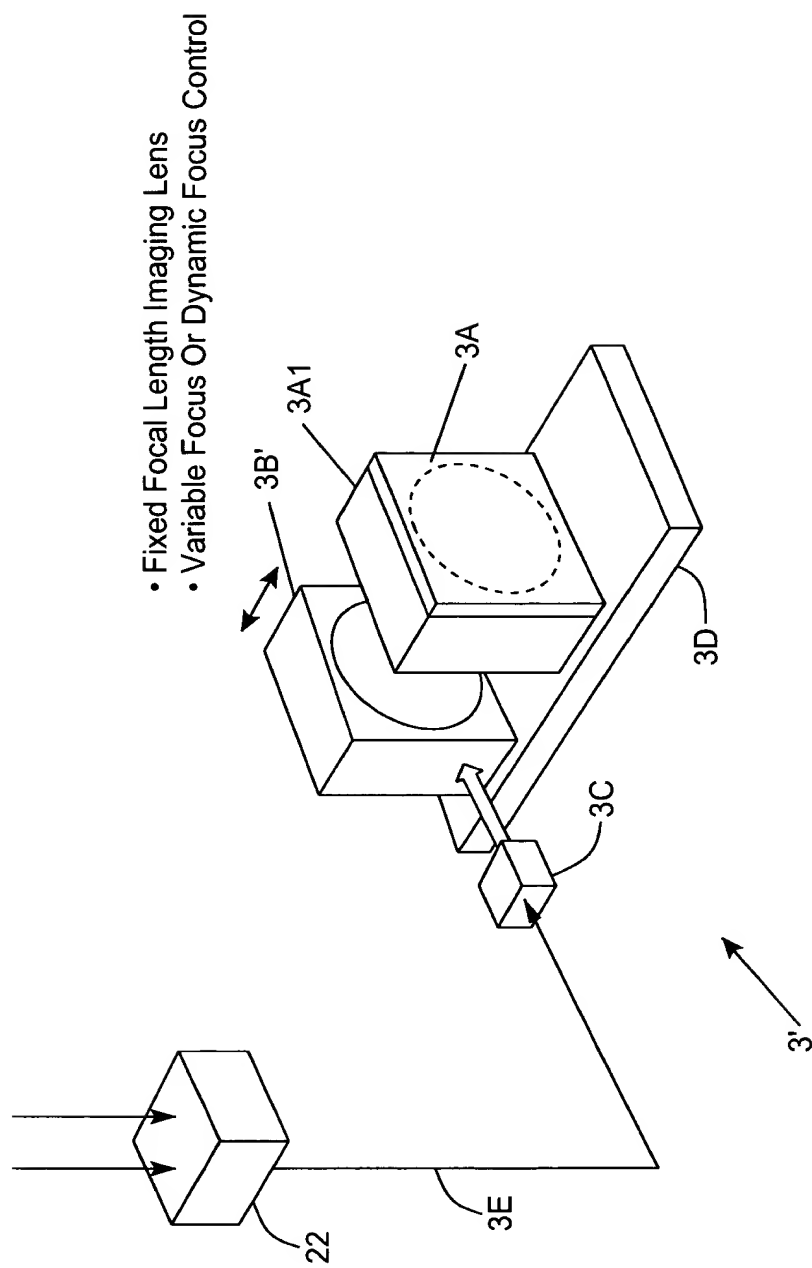


FIG. 2F3



Top Conveyor Scanner:

- Fixed Focal Length Imaging Lens
- Variable Focal Distance Control

Side Conveyor Scanner:

- Fixed Focal Length Imaging Lens
- Dynamic Focal Distance Control

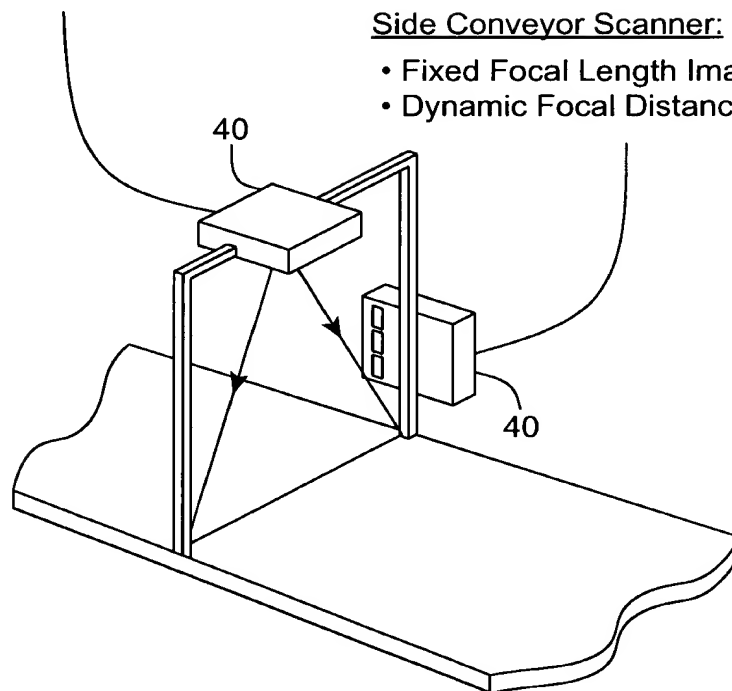


FIG. 2G

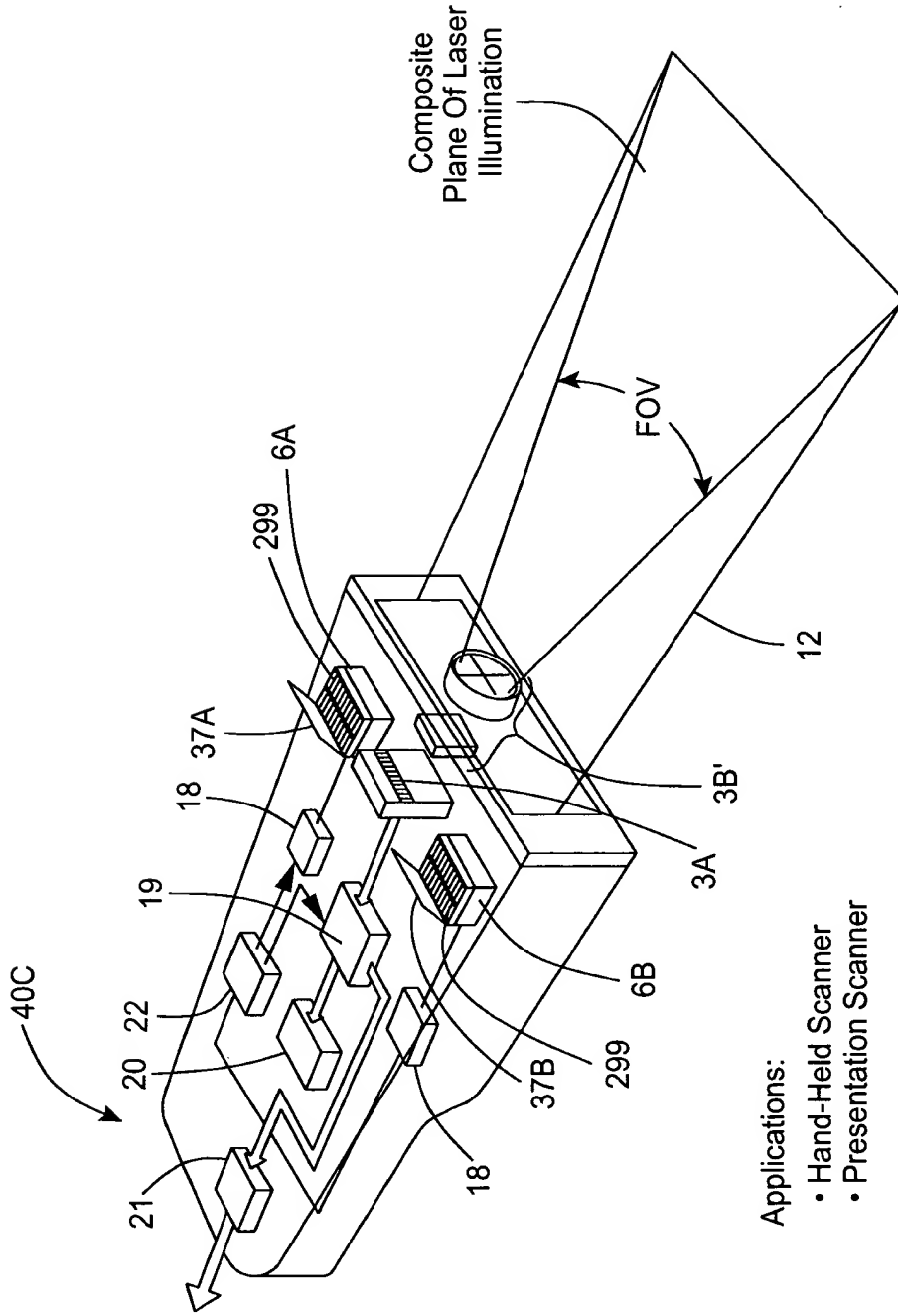


FIG. 2H

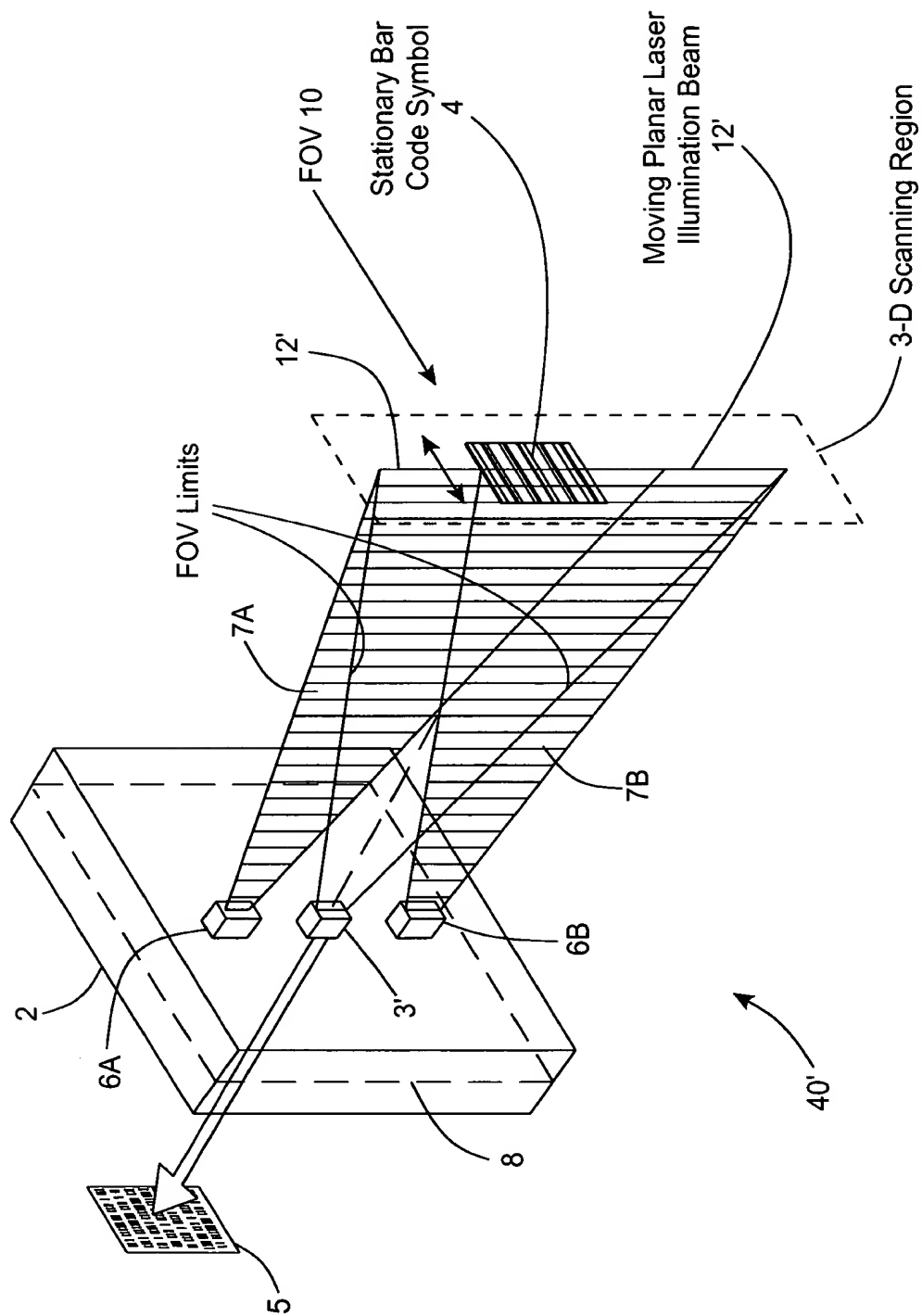


FIG. 2I1

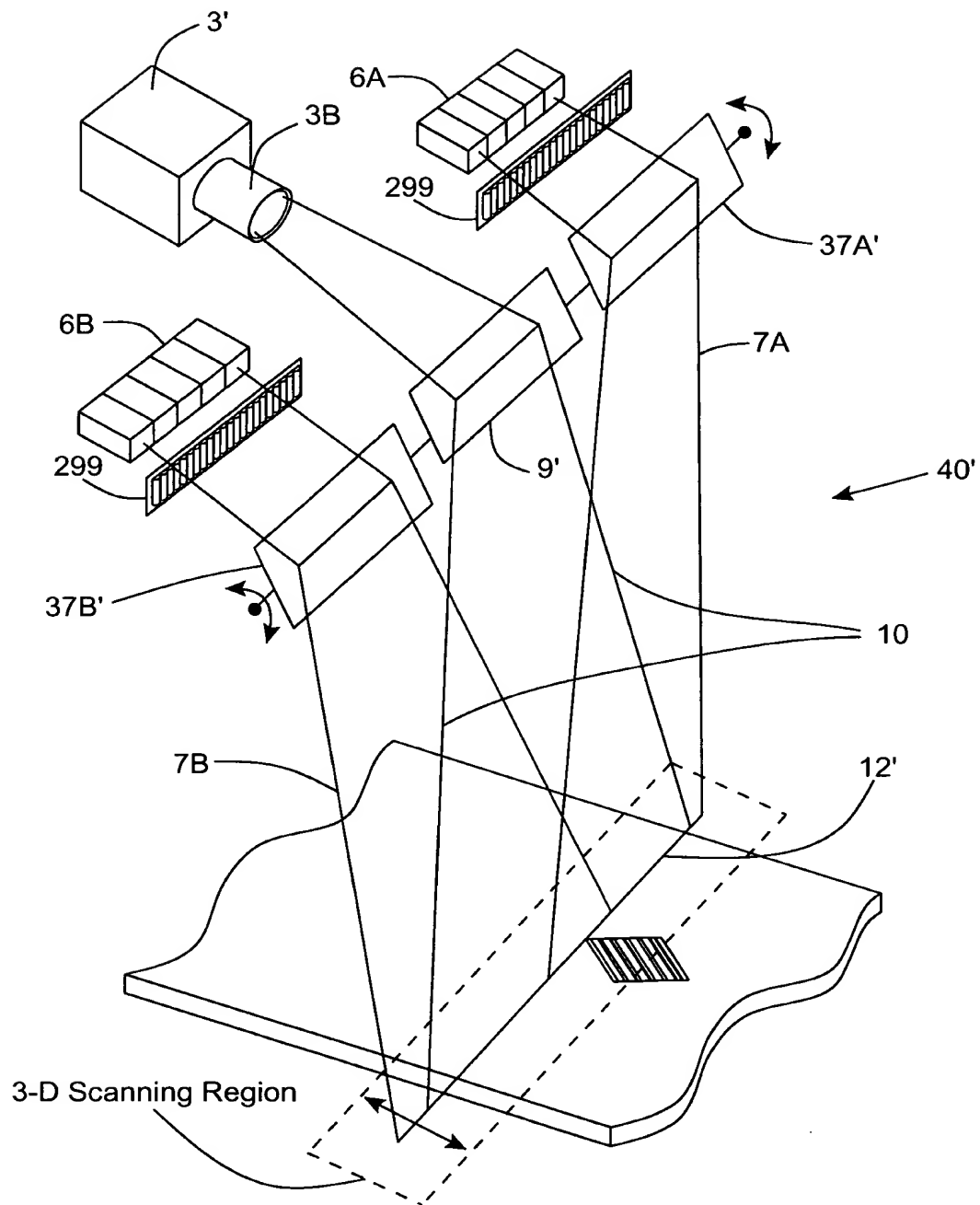


FIG. 212

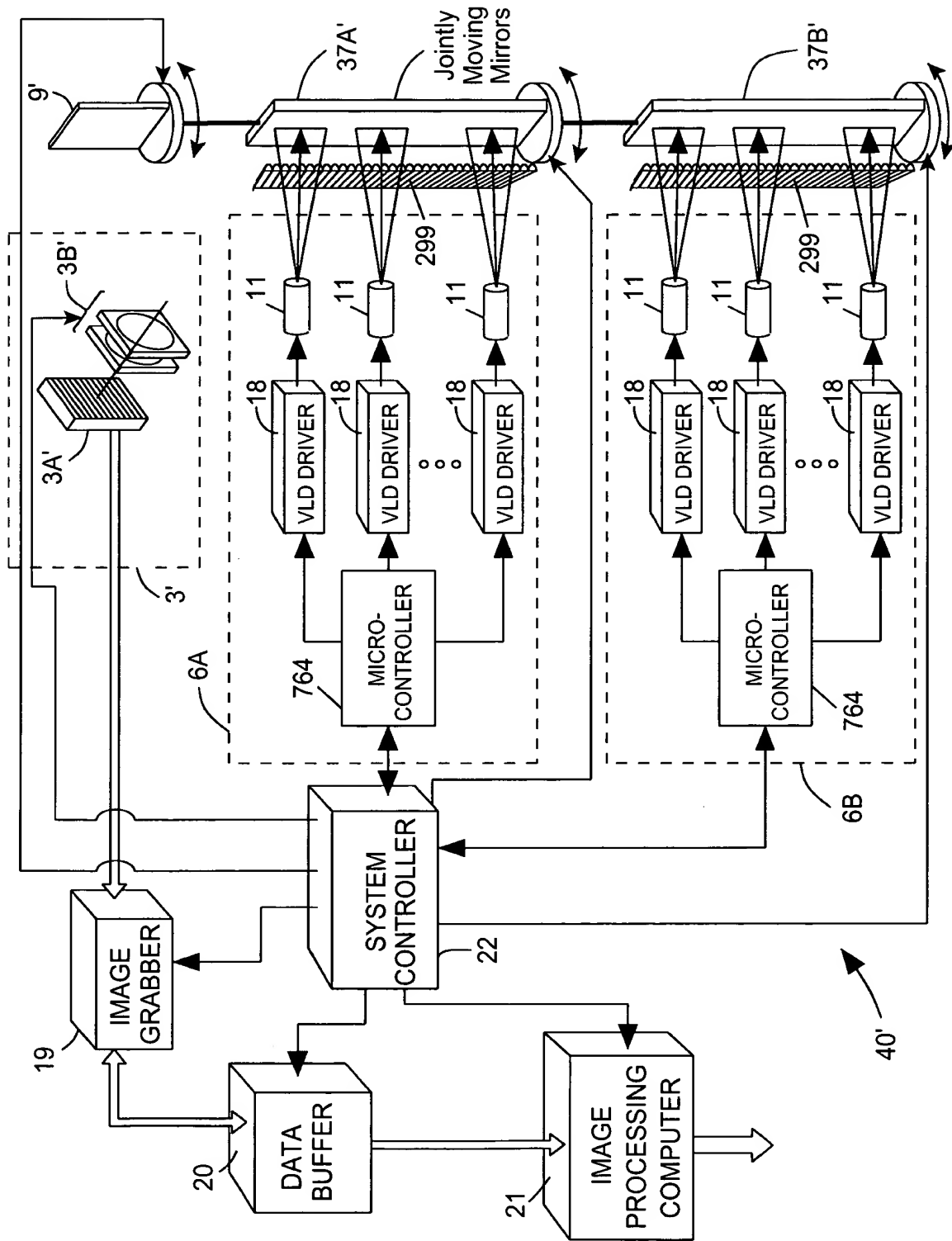


FIG. 213

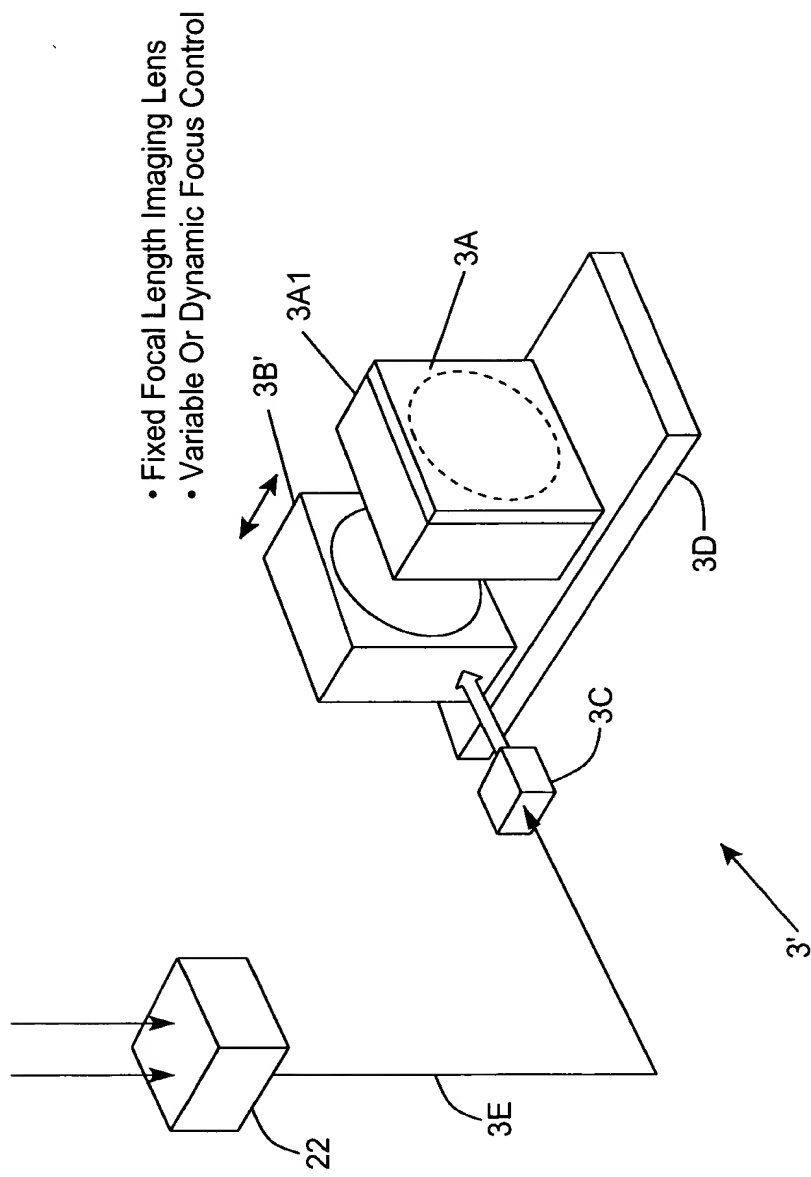


FIG. 2I4



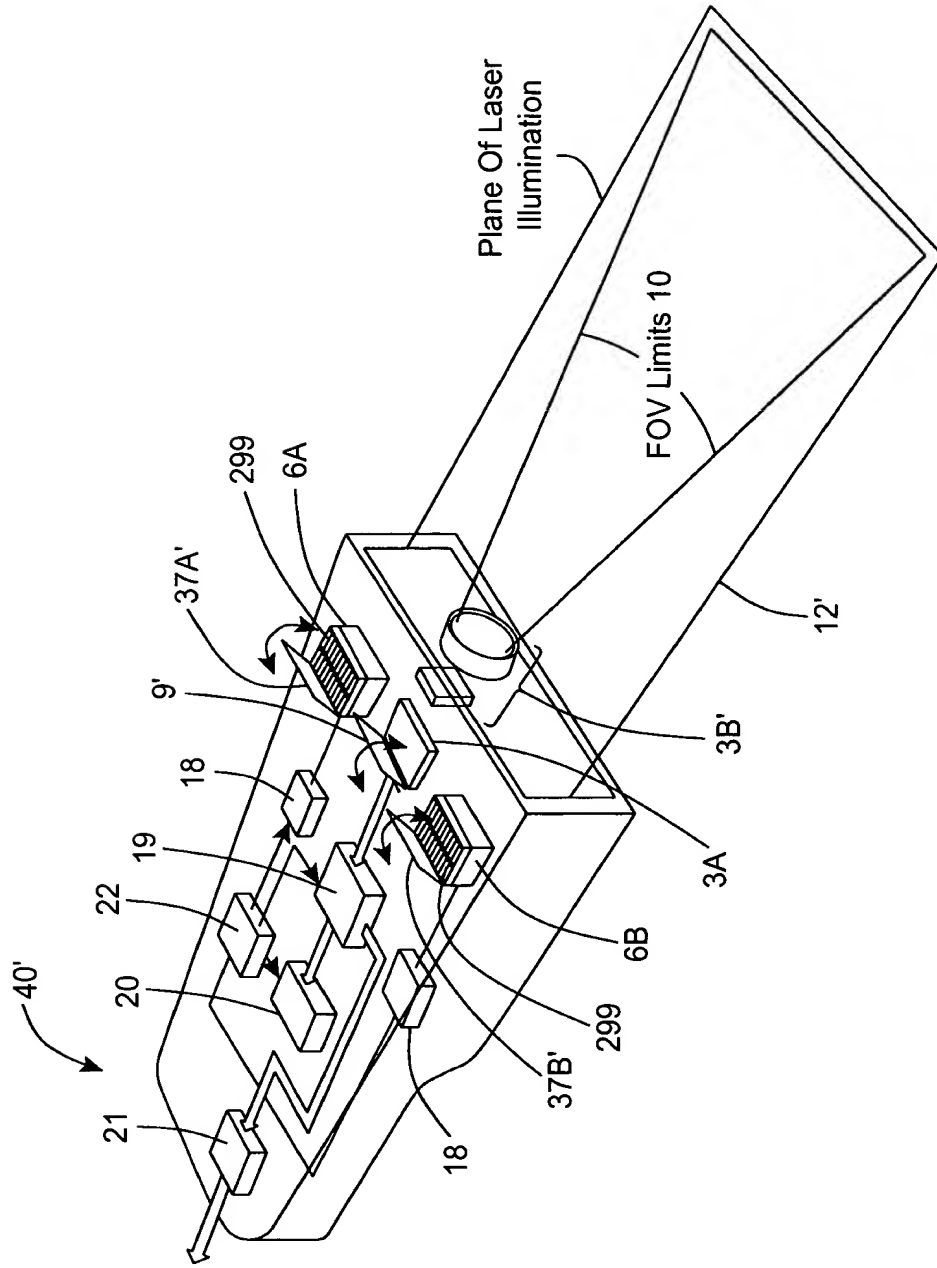


FIG. 215

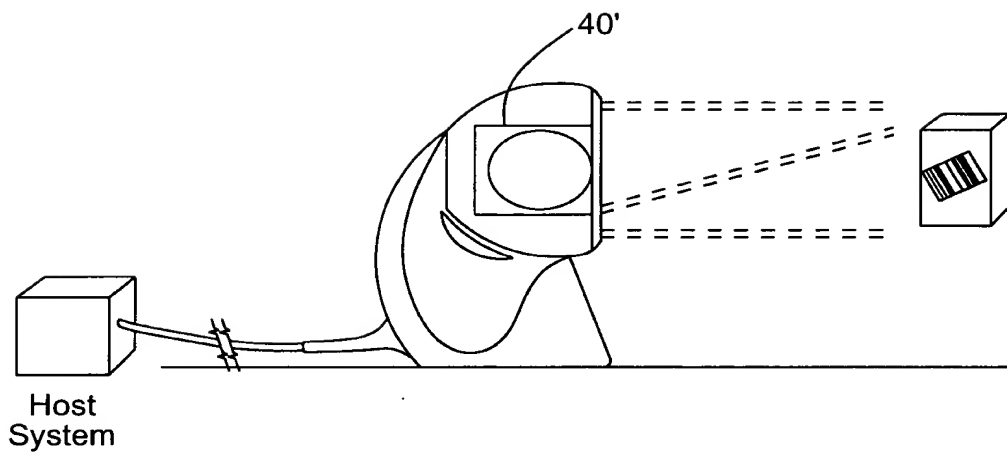
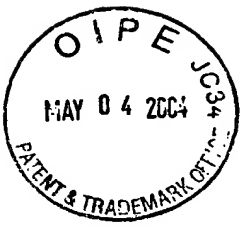


FIG. 216

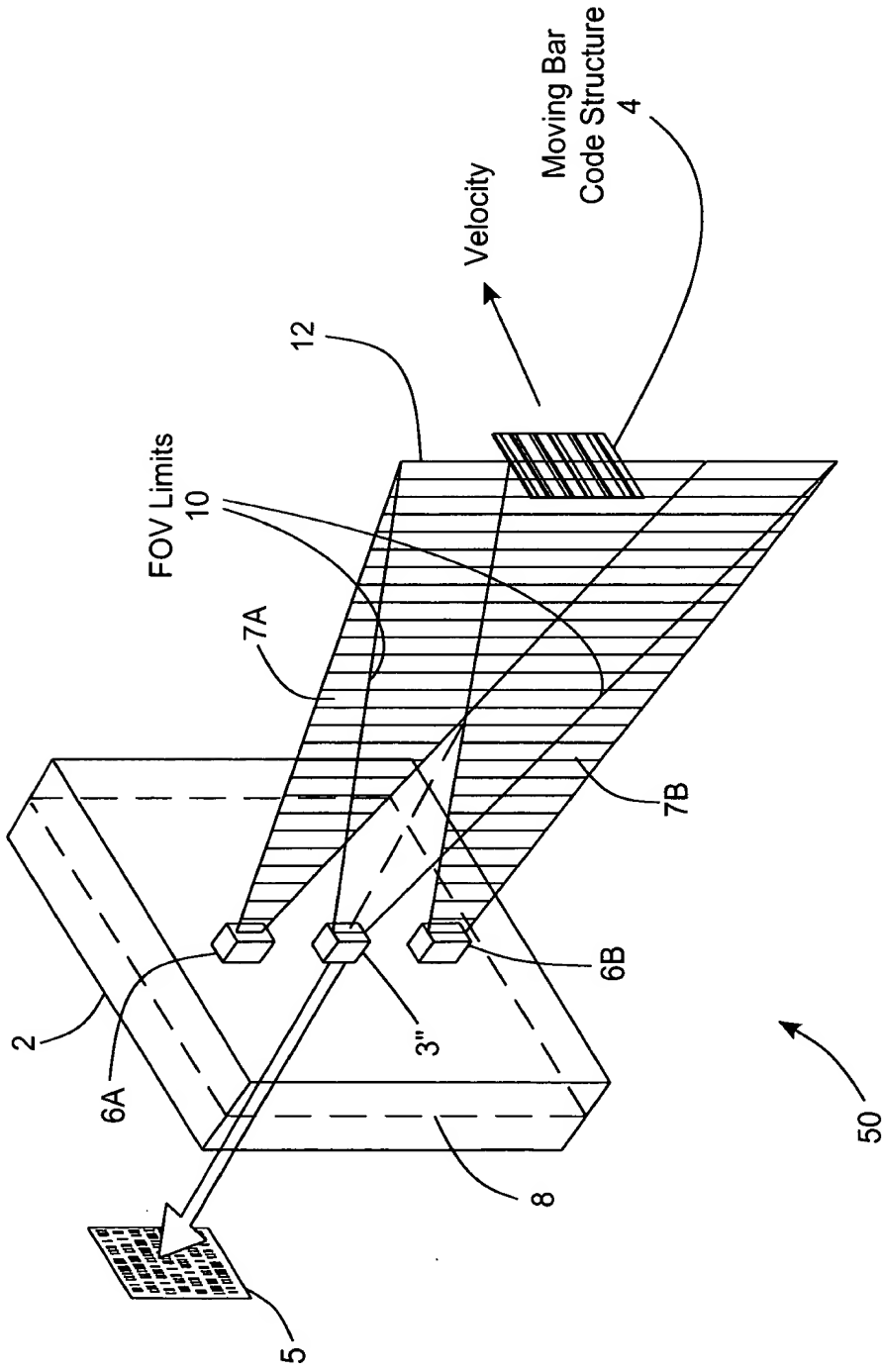


FIG. 3A

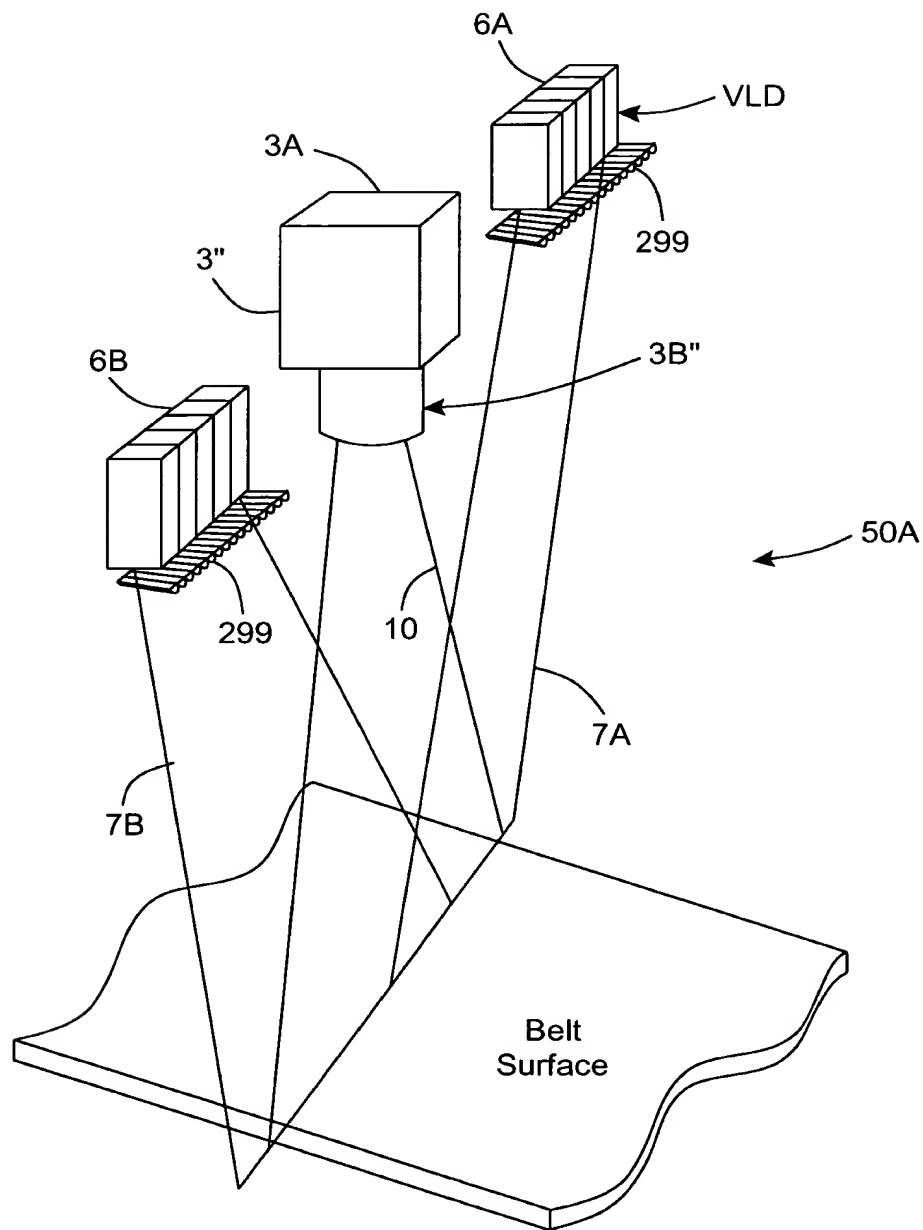


FIG. 3B1

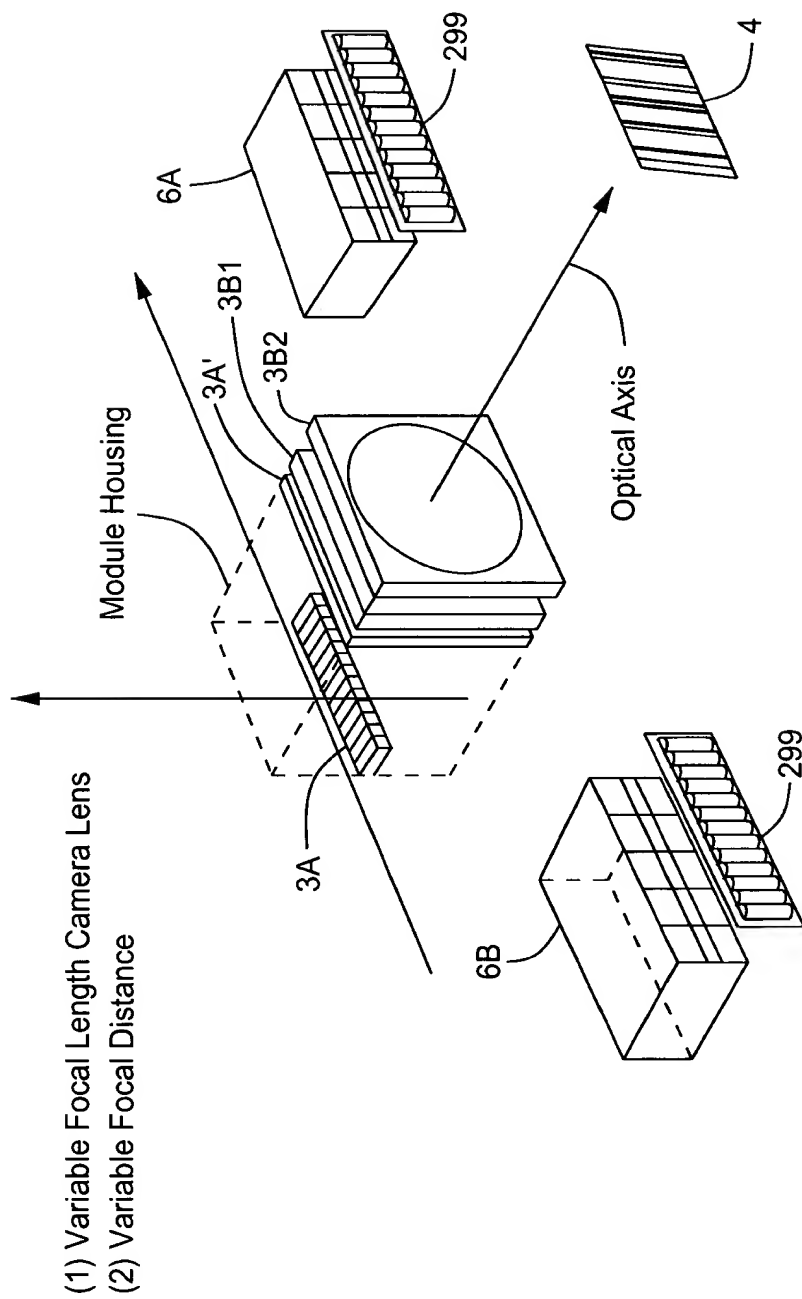


FIG. 3B2

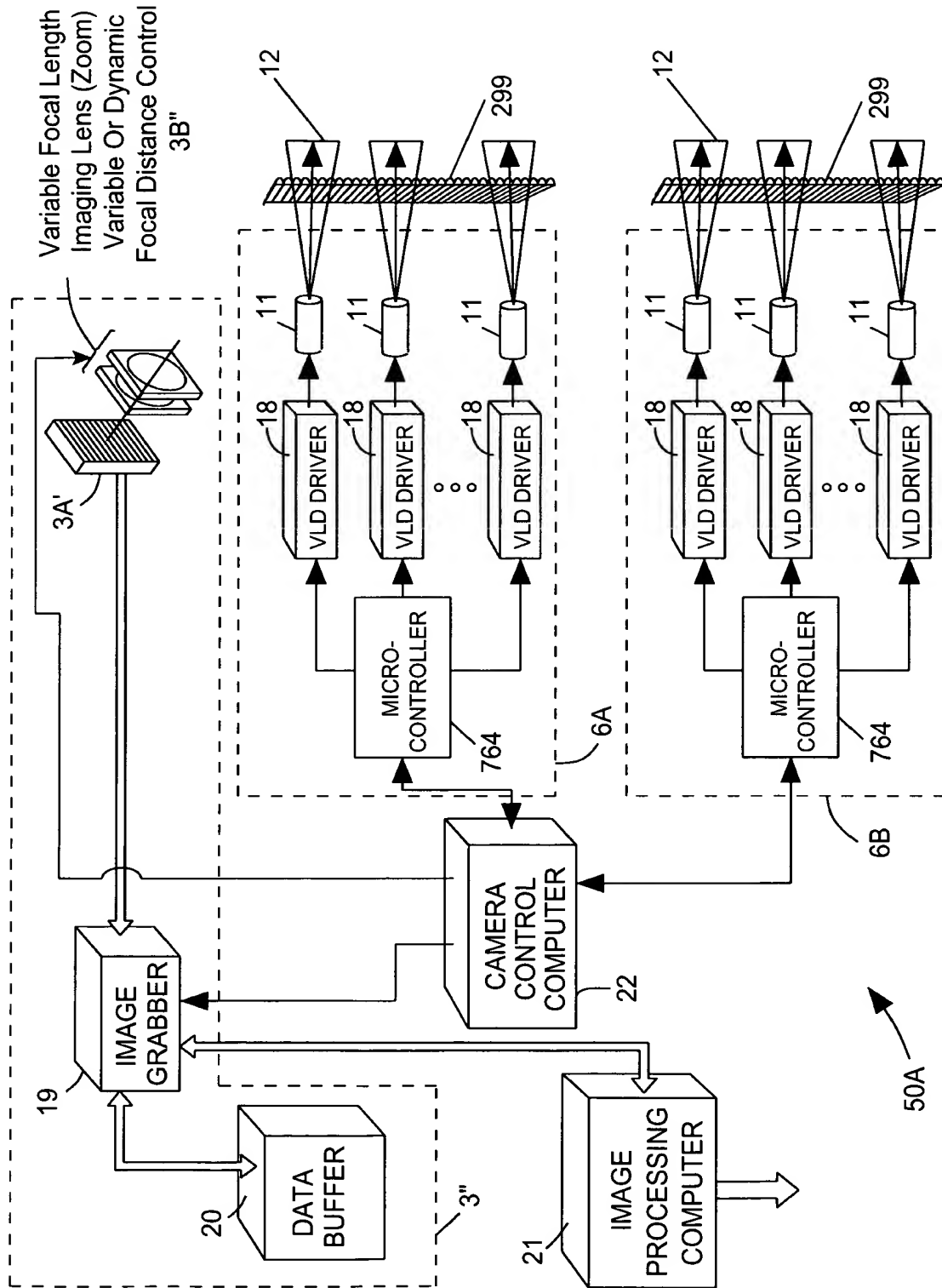


FIG. 3C1

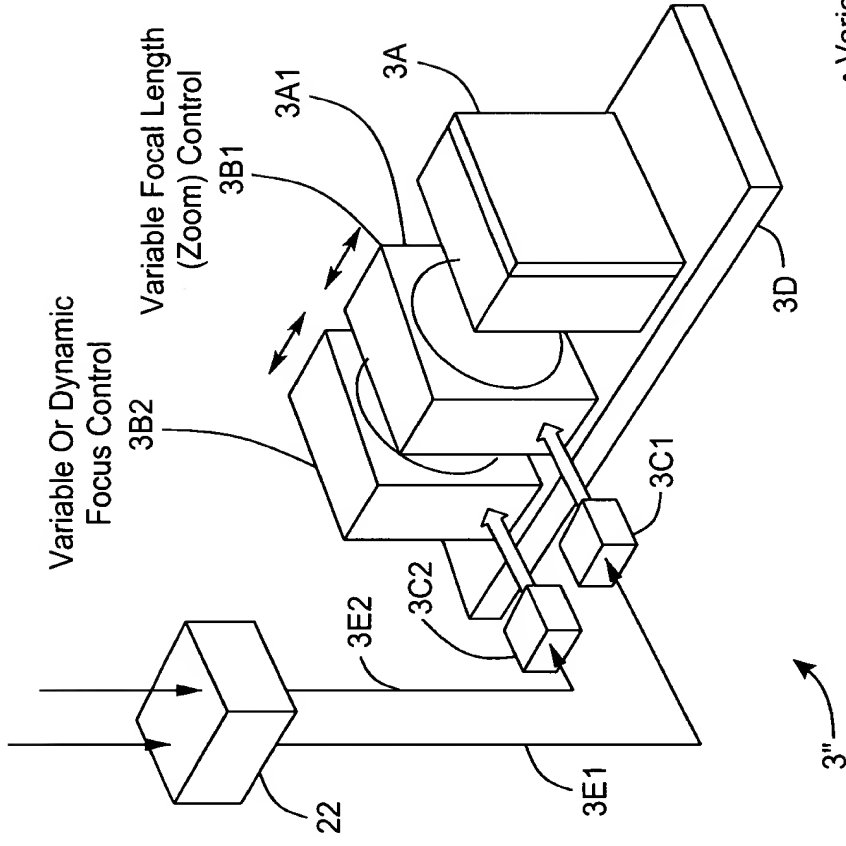


FIG. 3C2

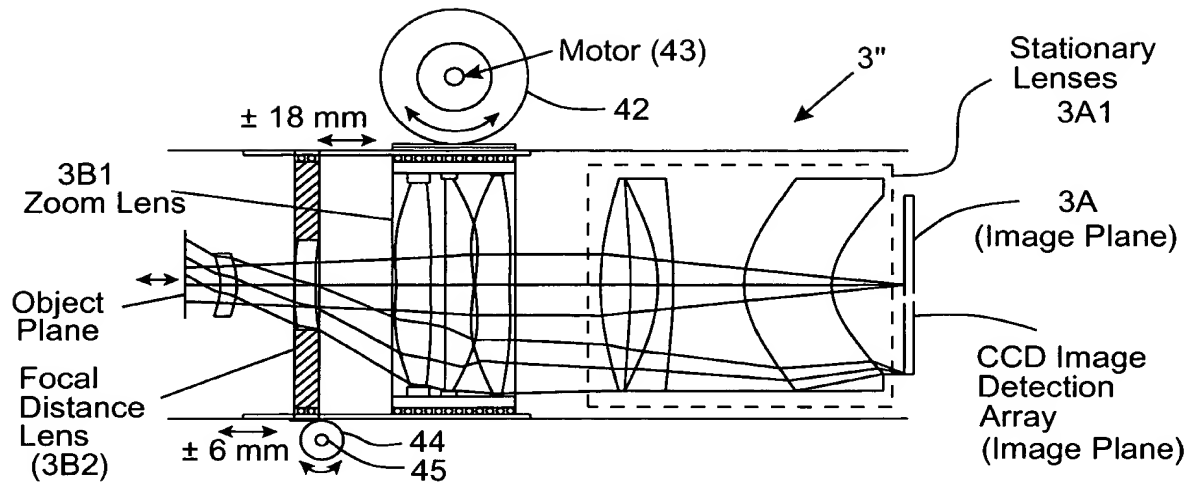


FIG. 3D1

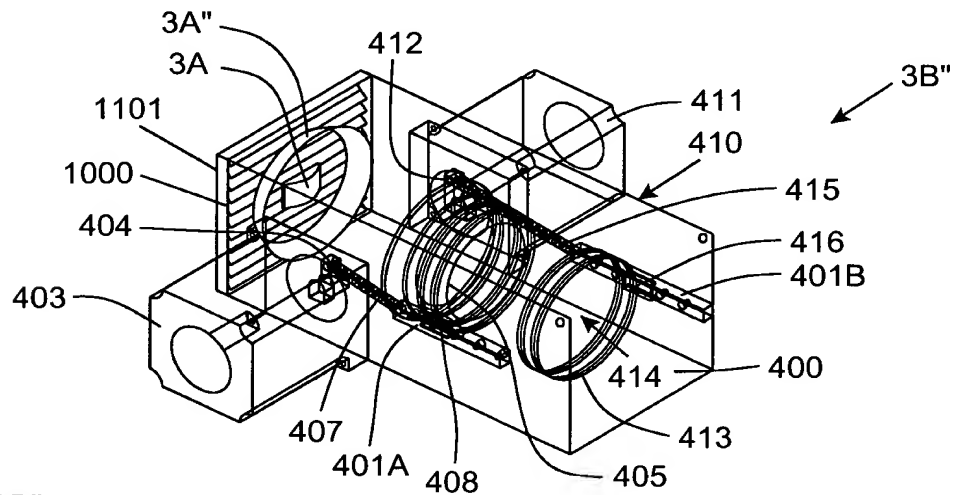


FIG. 3D2

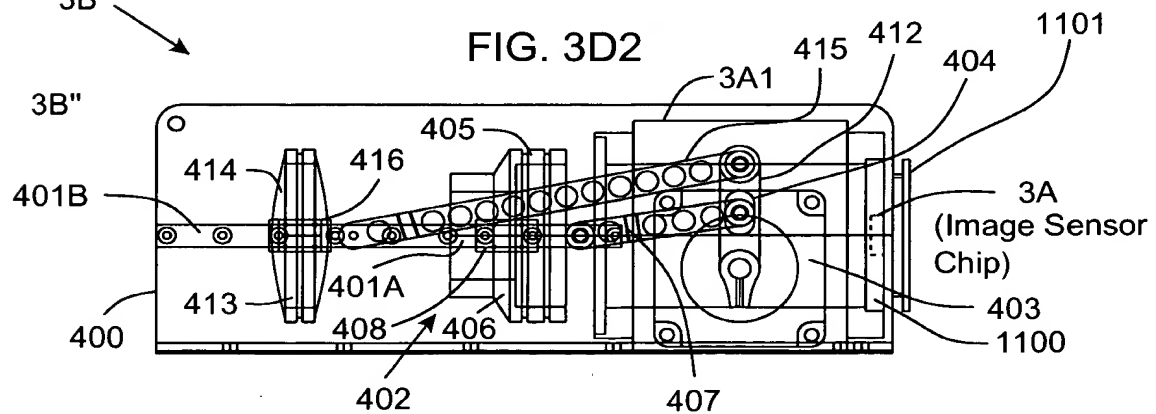


FIG. 3D3



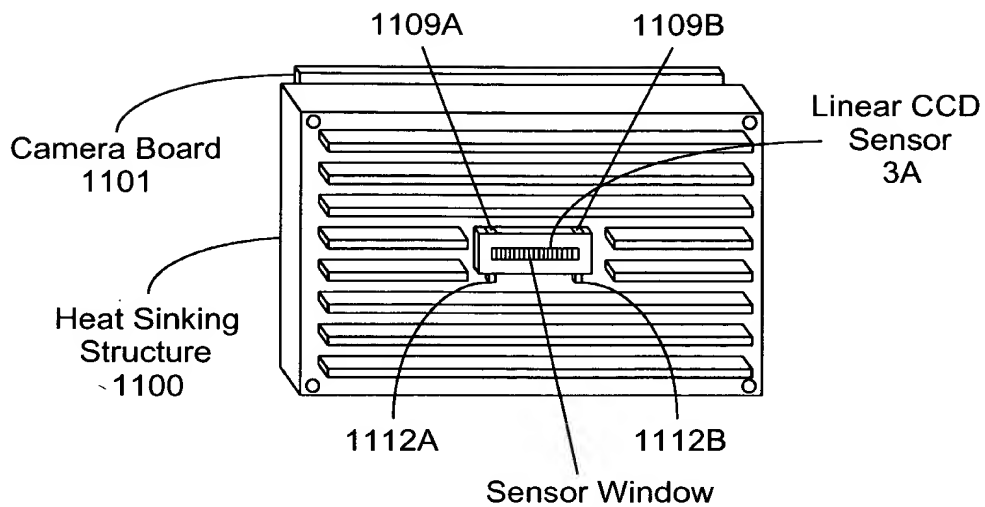


FIG. 3D4

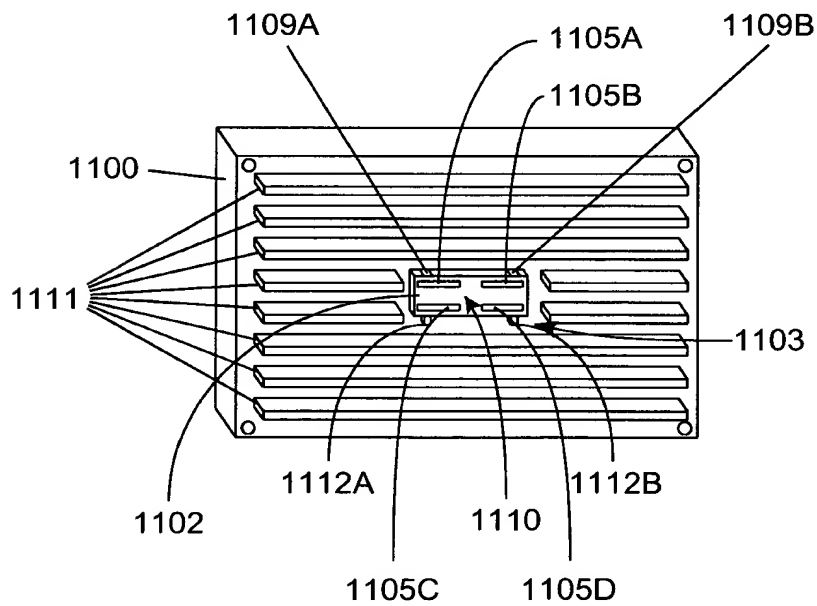


FIG. 3D5

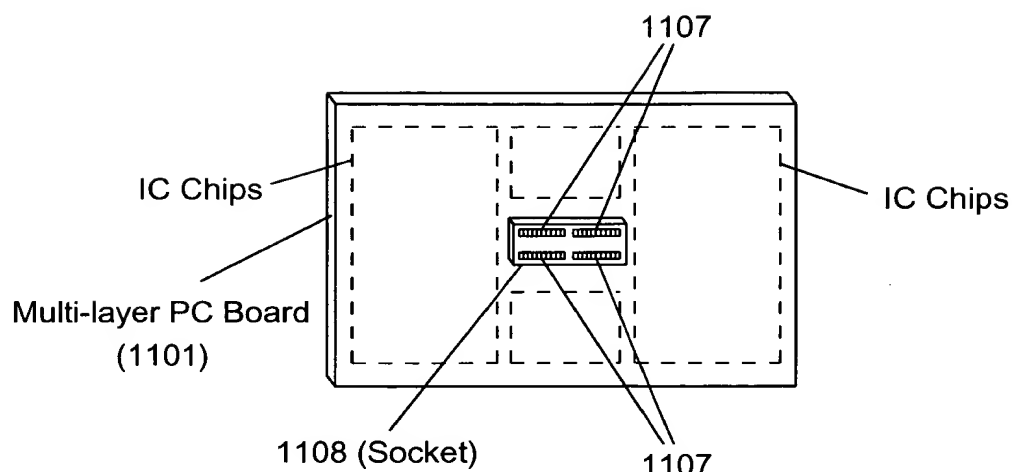


FIG. 3D6

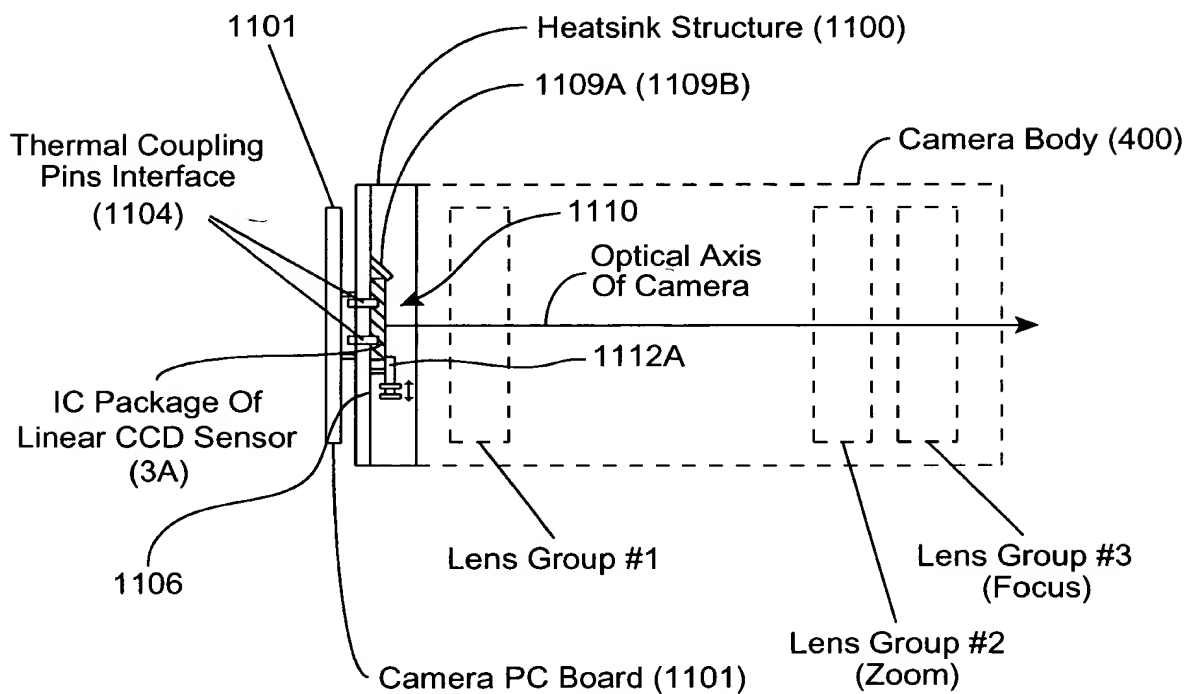


FIG. 3D7

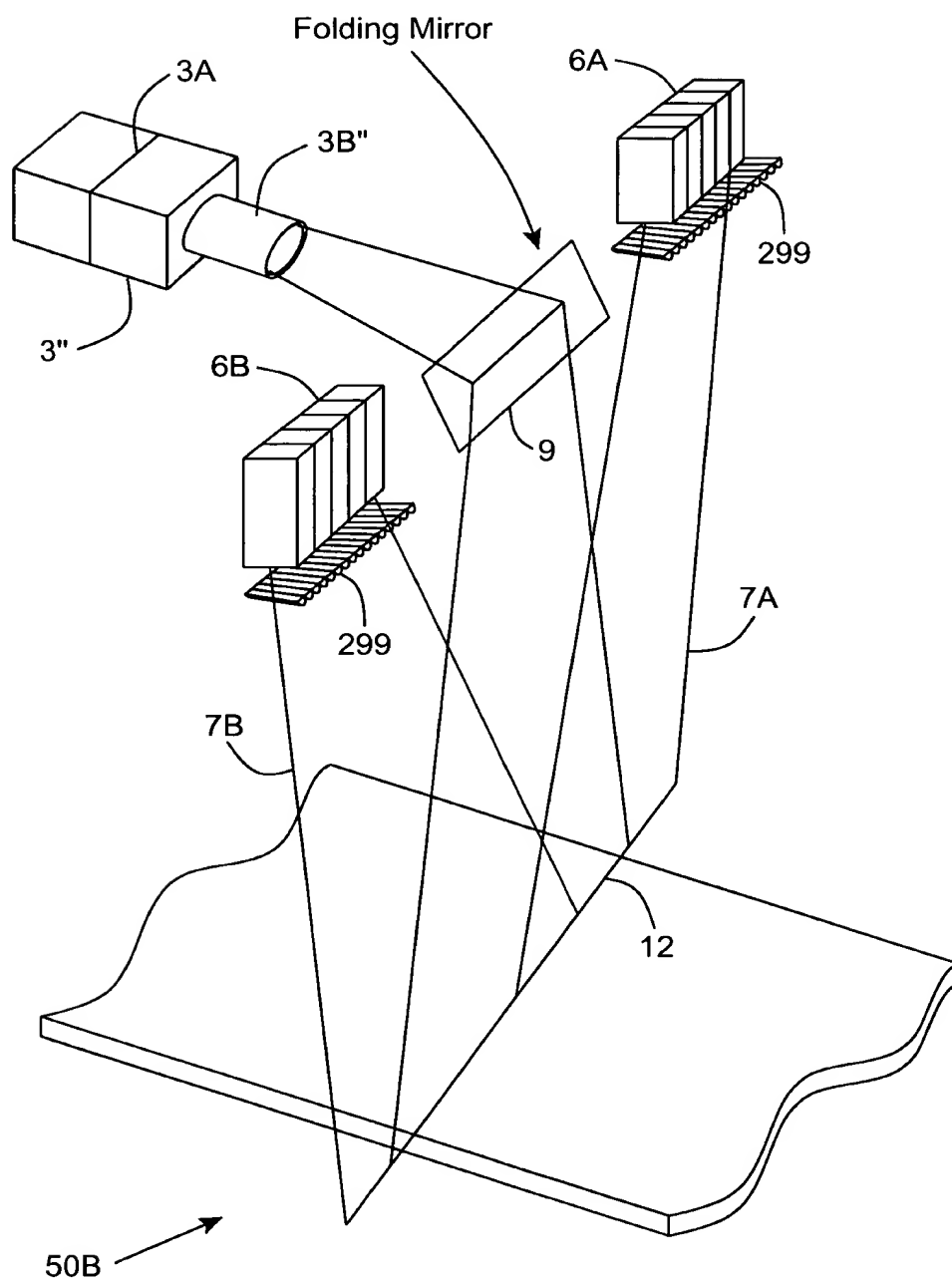


FIG. 3E1

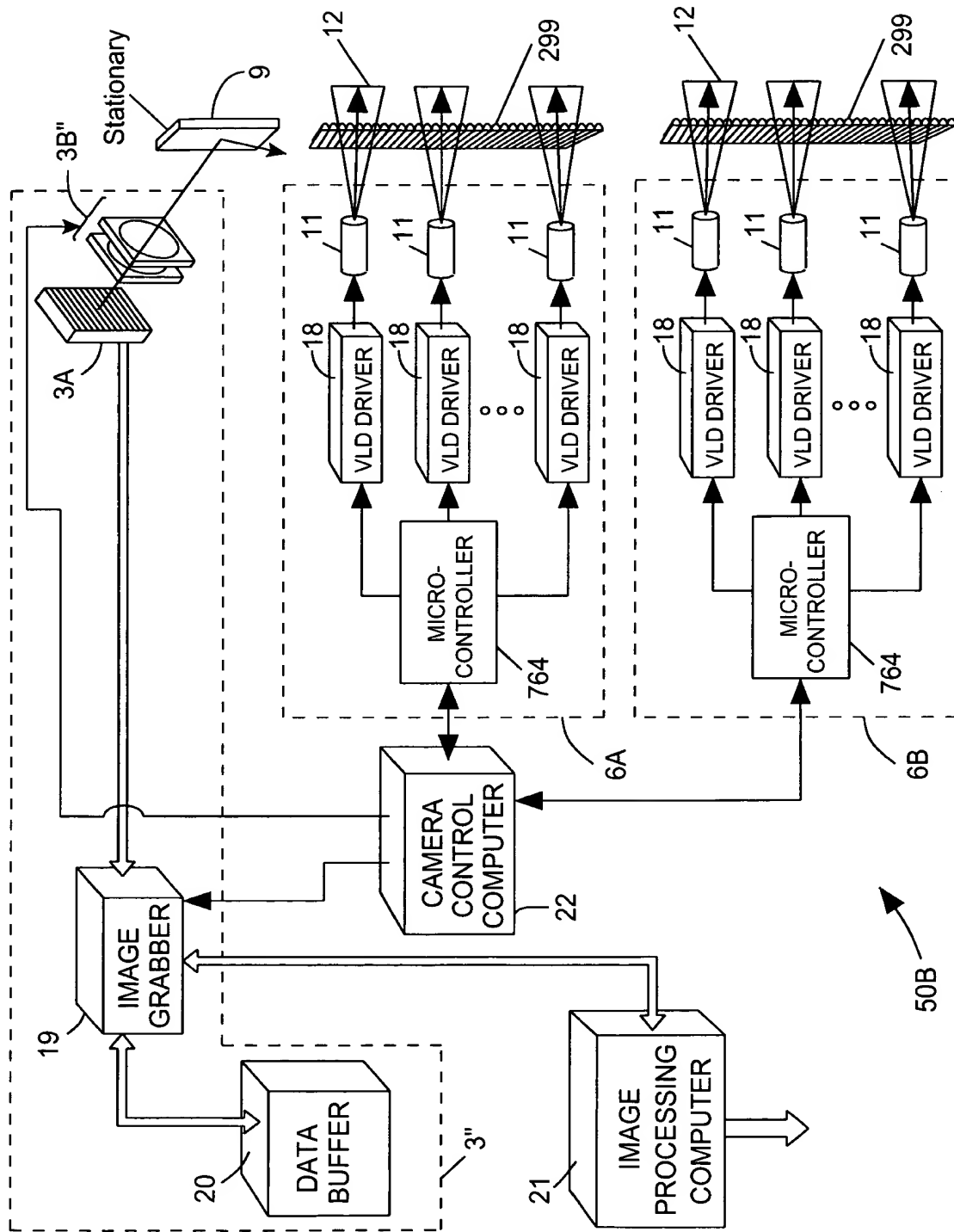


FIG. 3E2

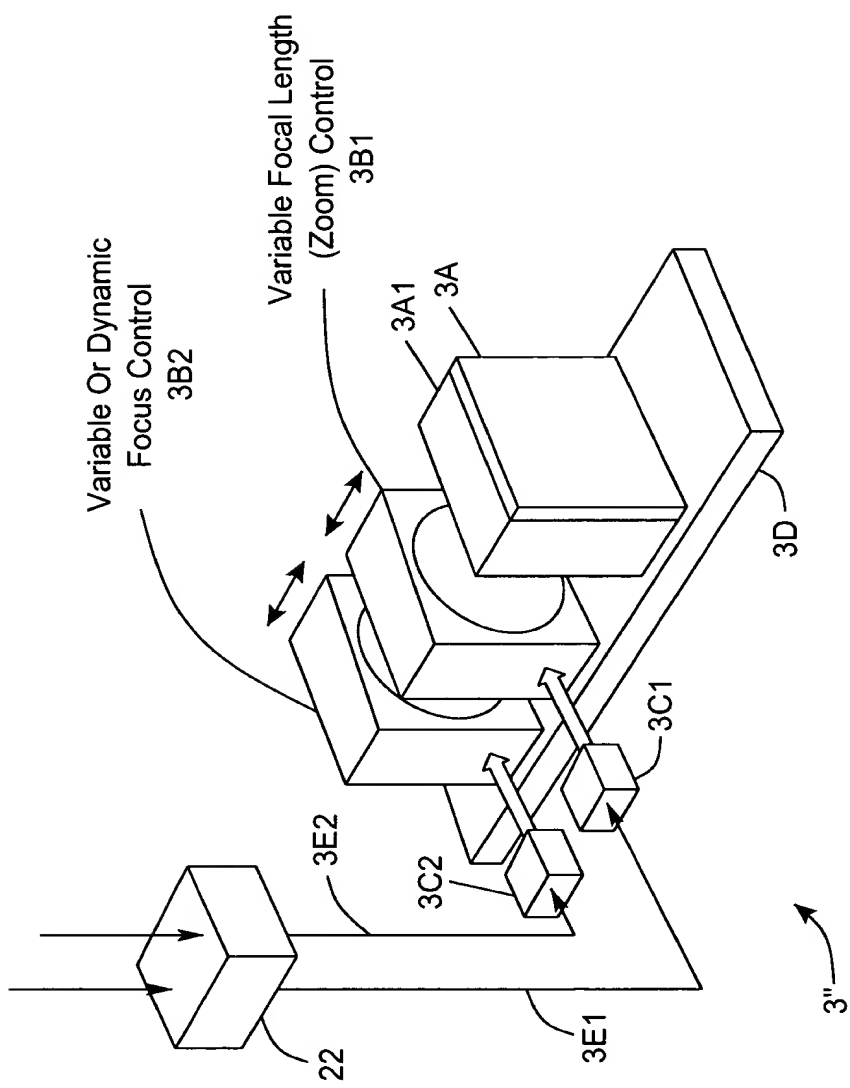


FIG. 3E3

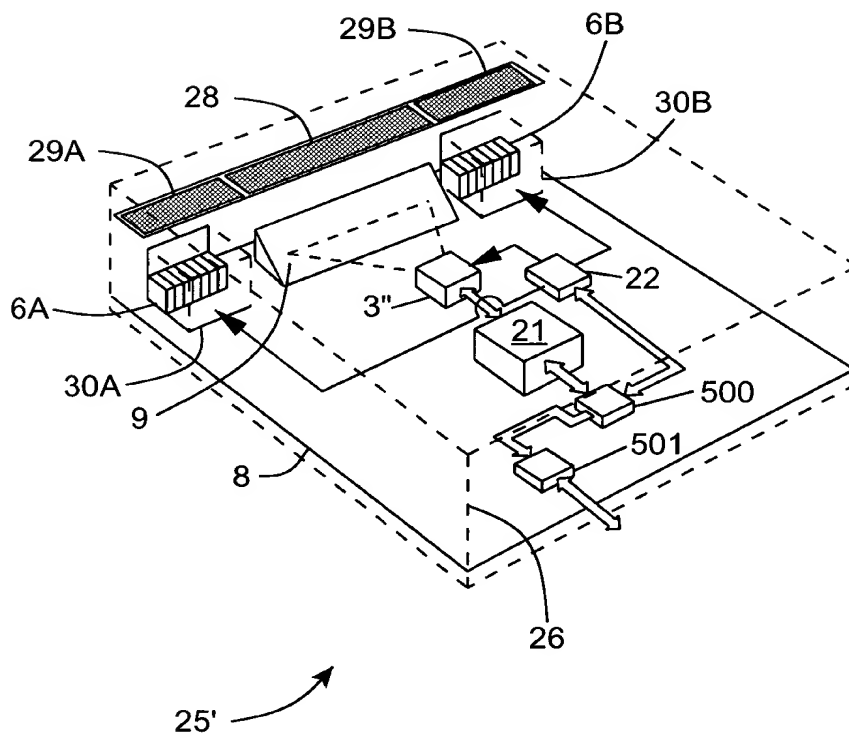


FIG. 3E4

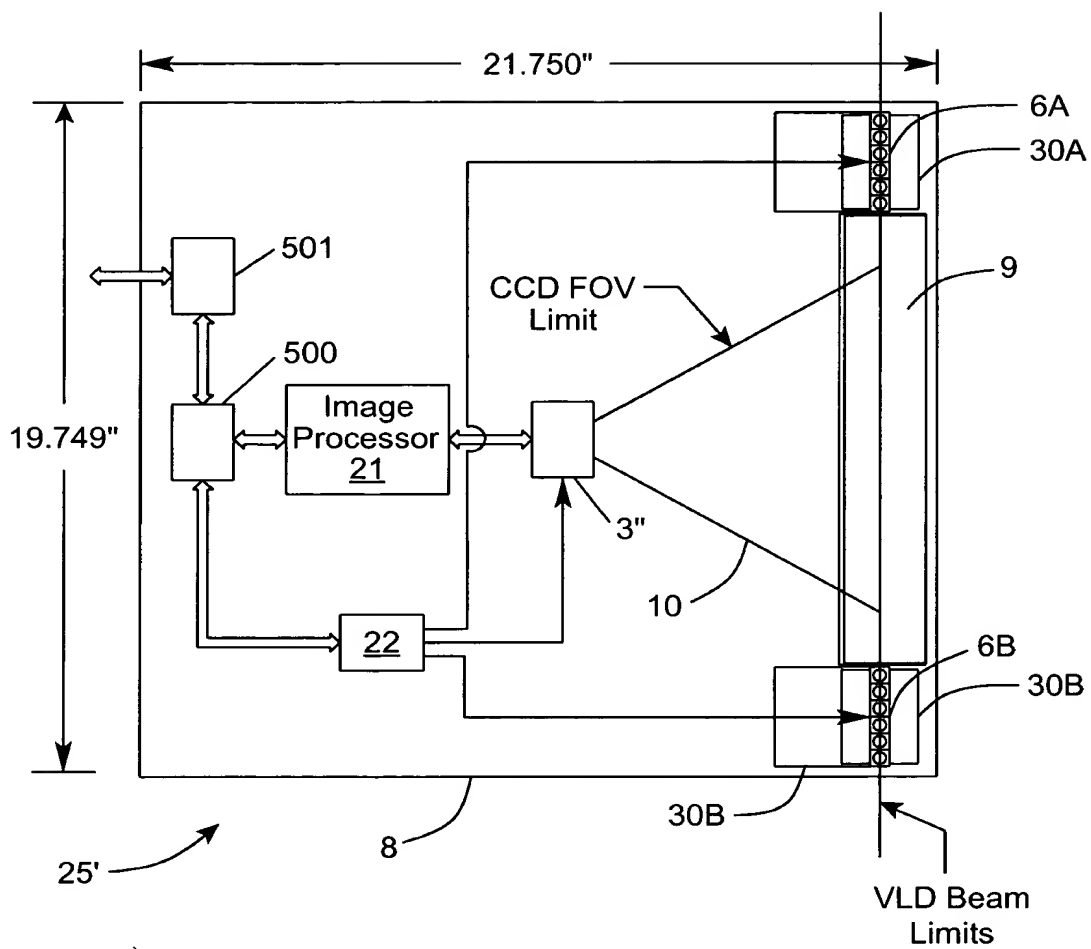


FIG. 3E5

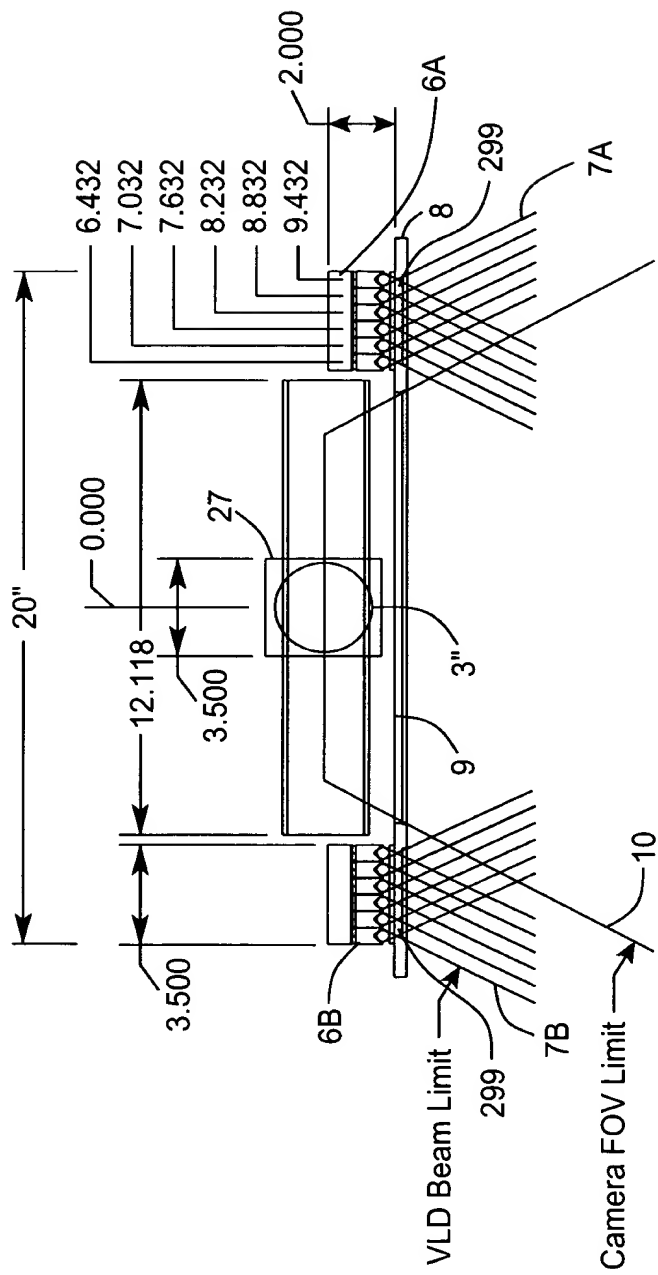


FIG. 3E6



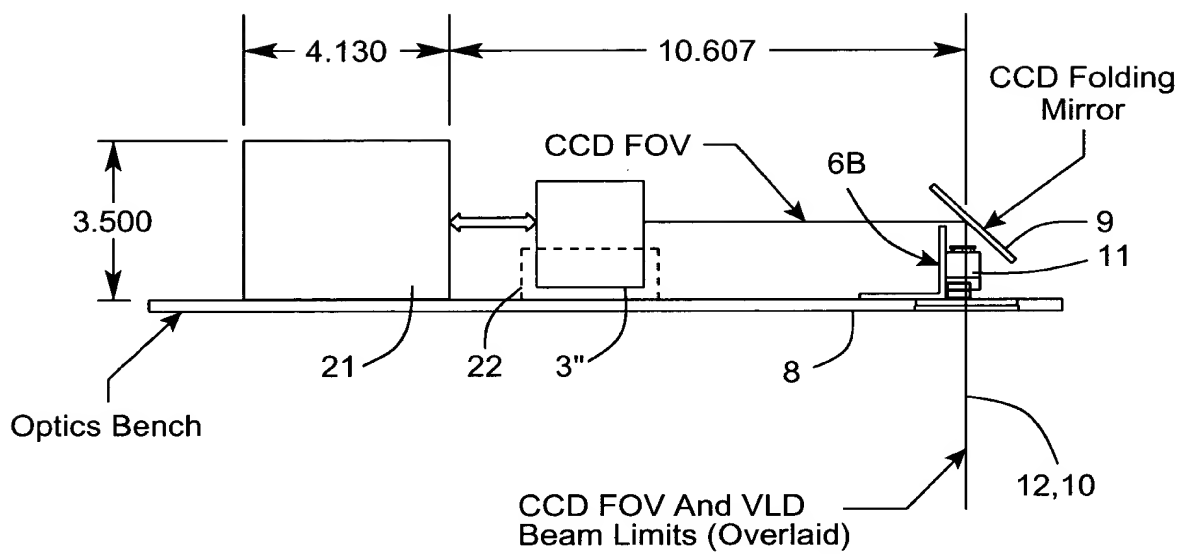


FIG. 3E7



\* Variable FOV

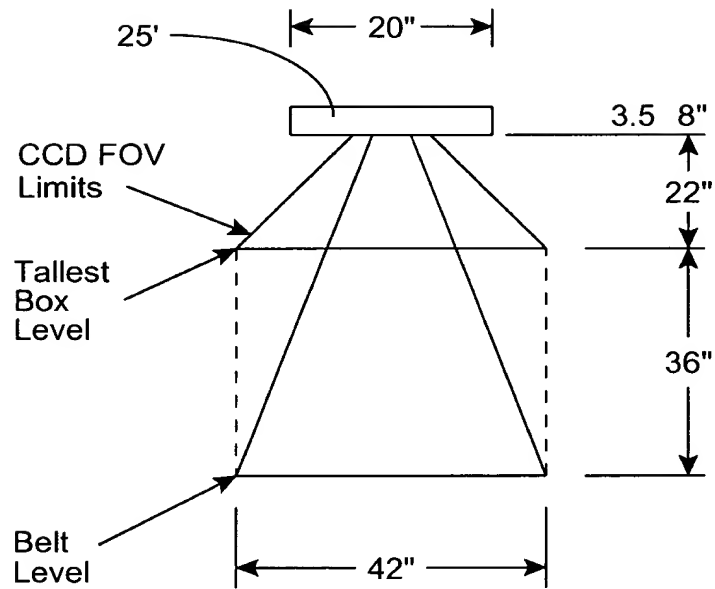


FIG. 3E8

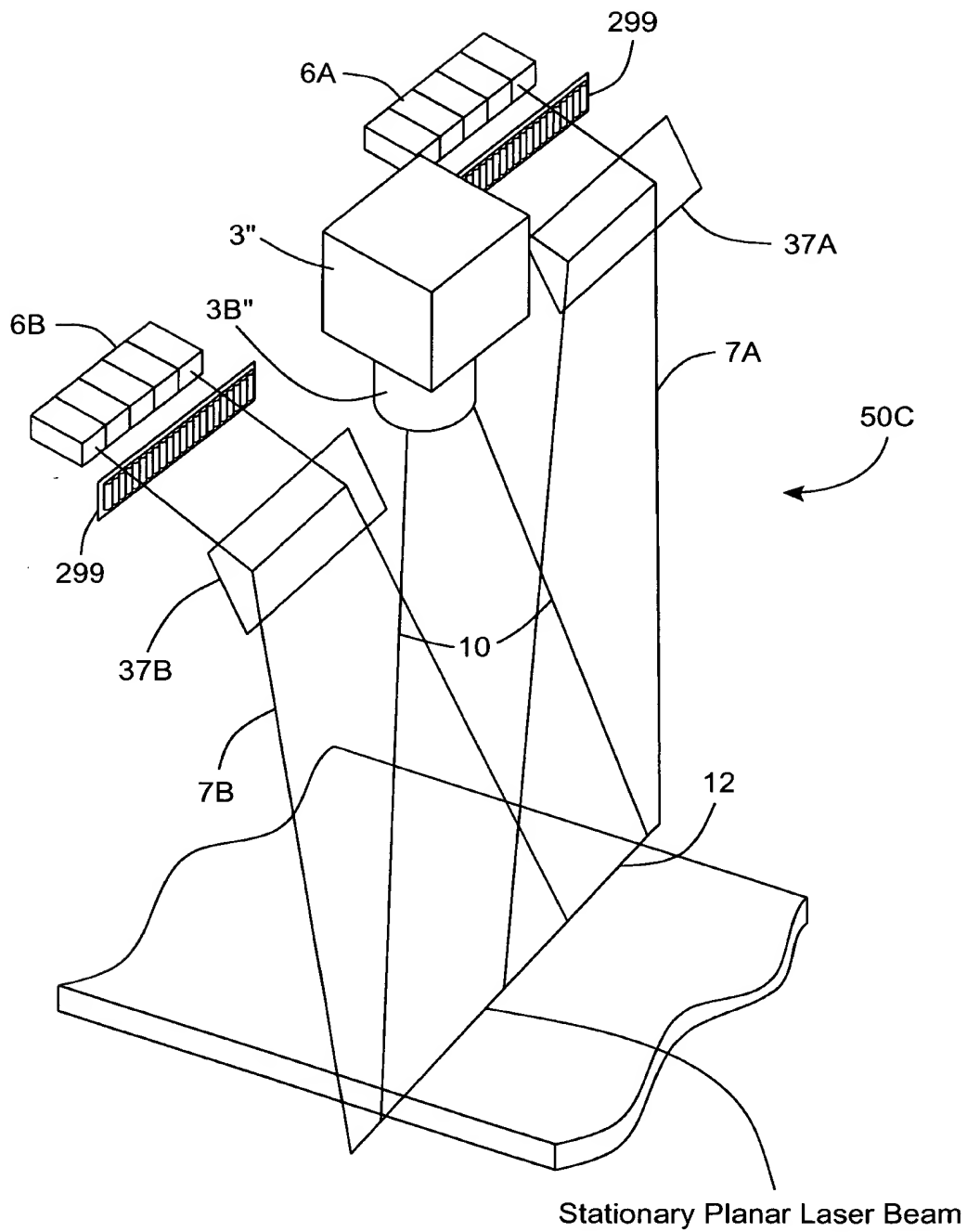


FIG. 3F1

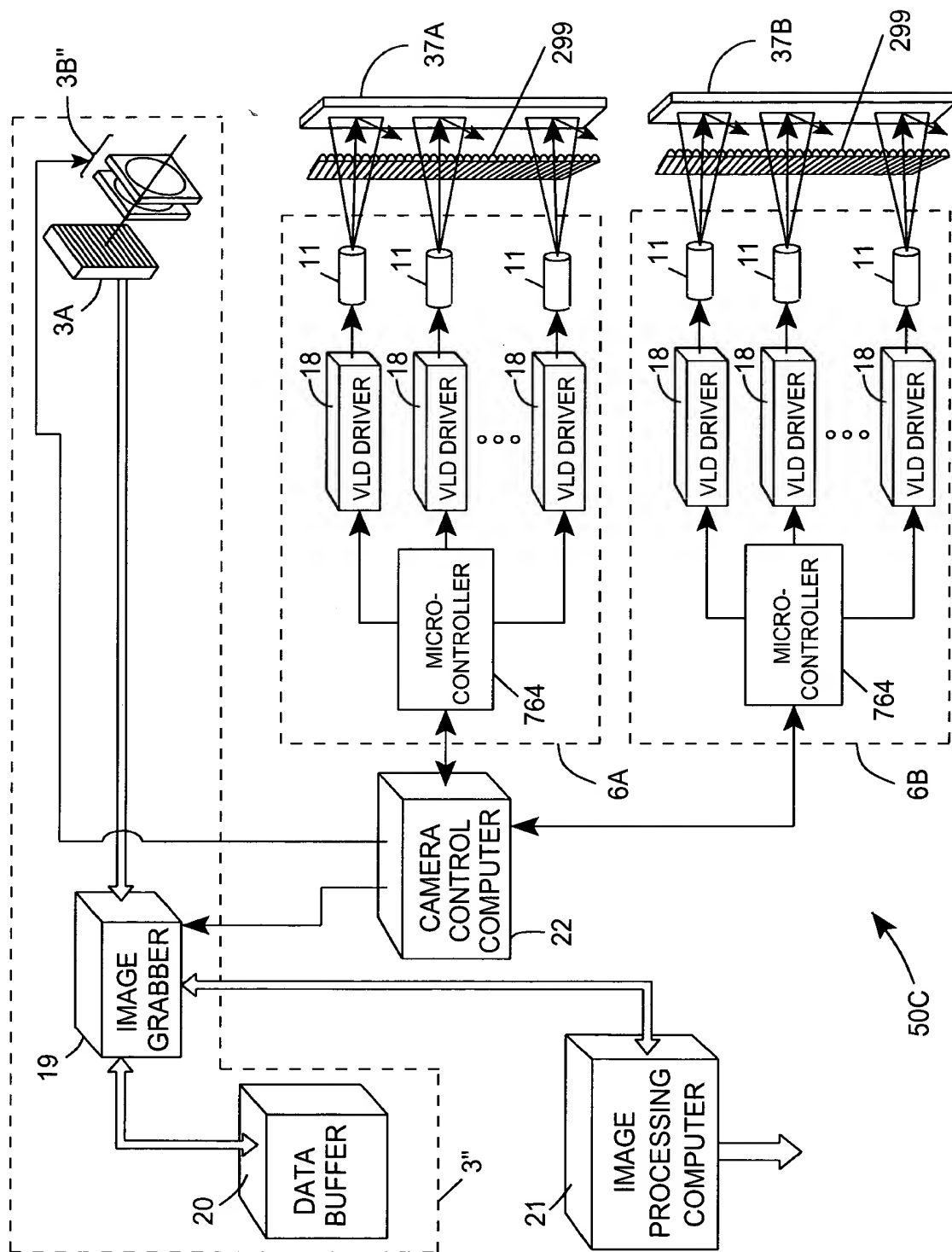


FIG. 3F2

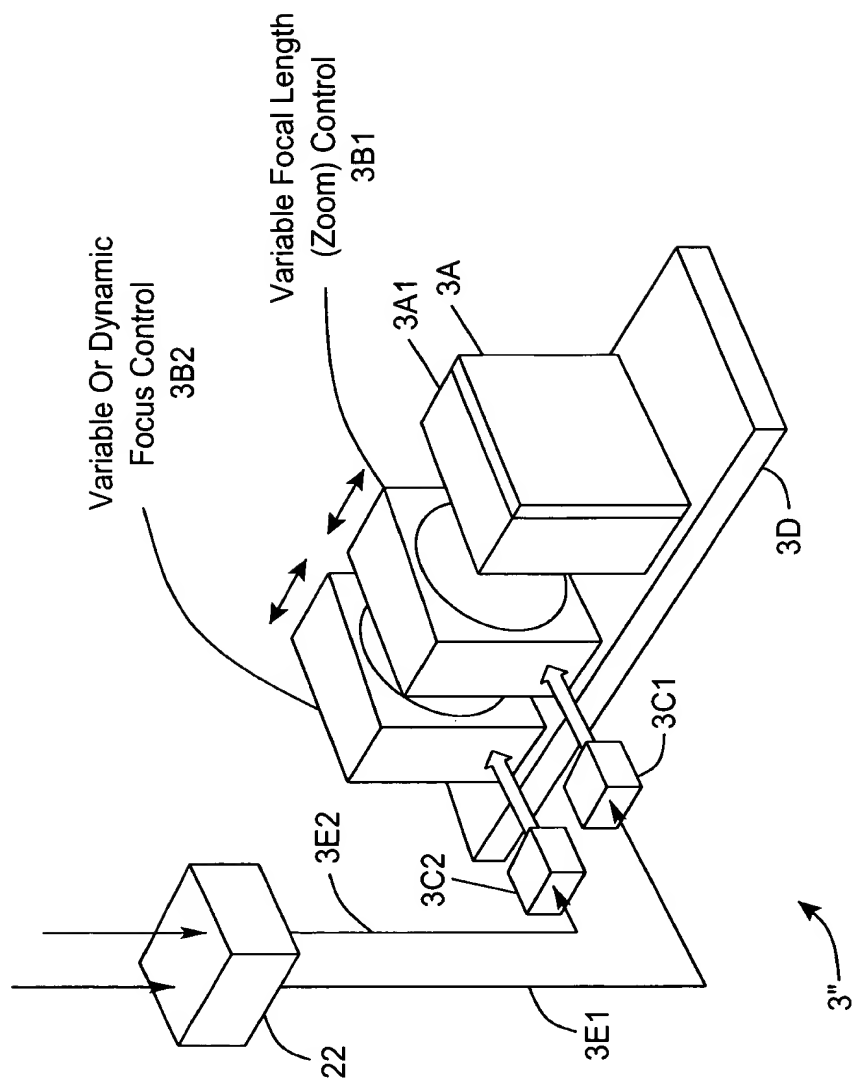


FIG. 3F3

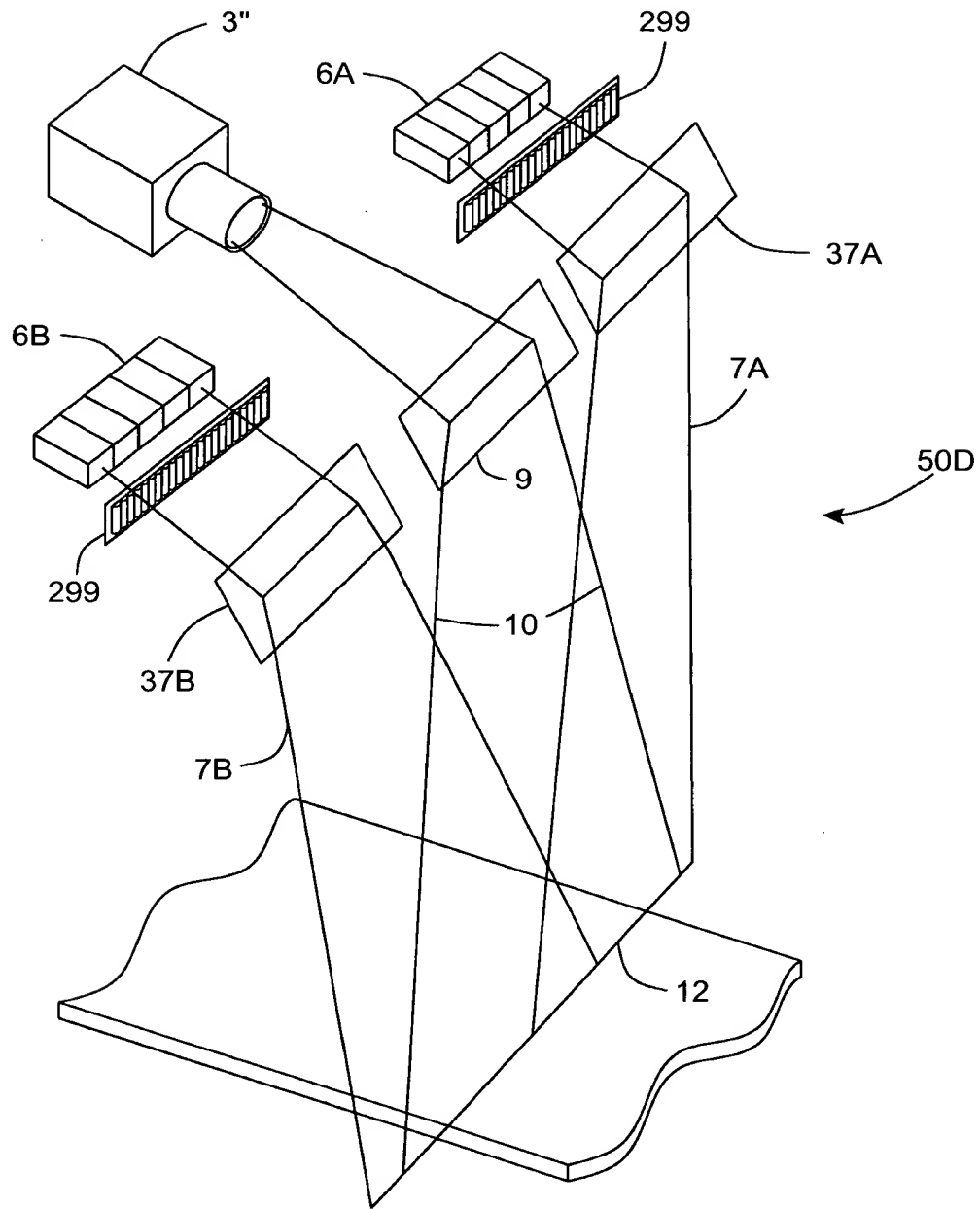


FIG. 3G1

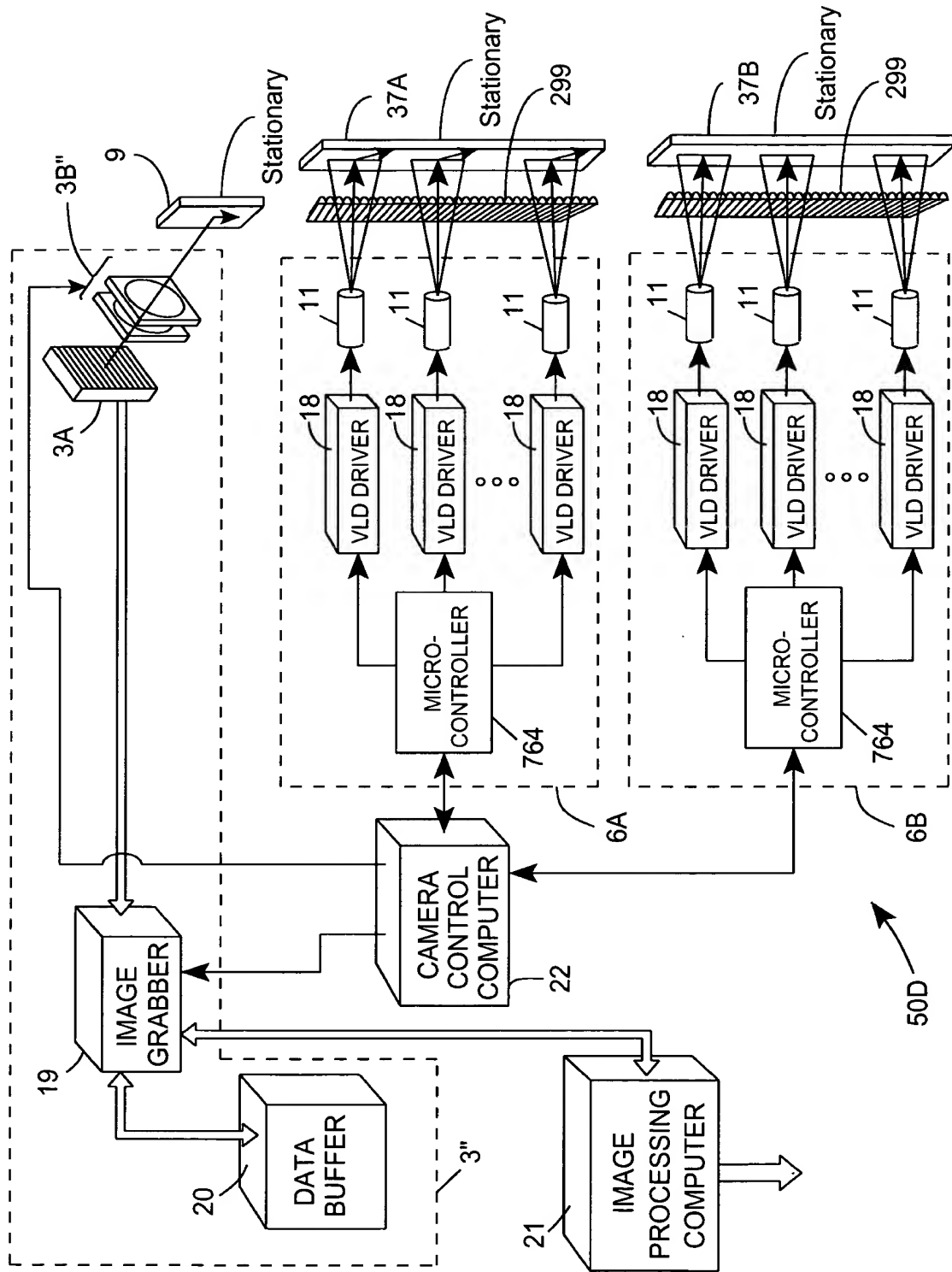


FIG. 3G2

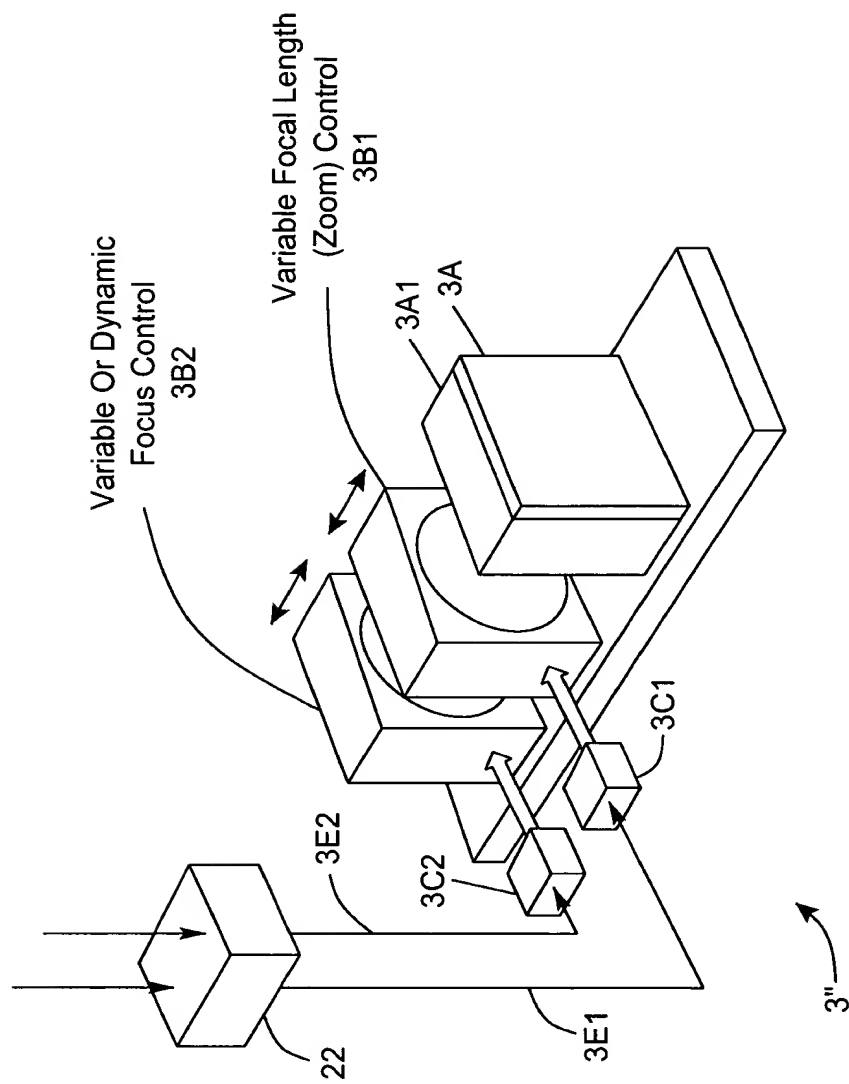


FIG. 3G3





- Variable Focal Length Imaging Lens
- Variable Focal Distance

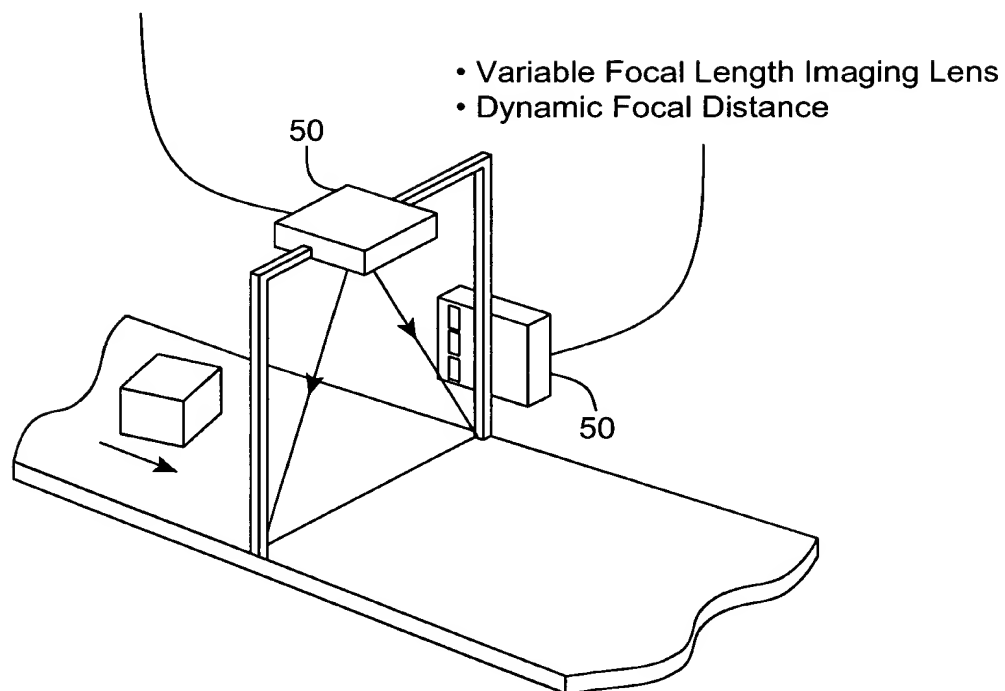


FIG. 3H

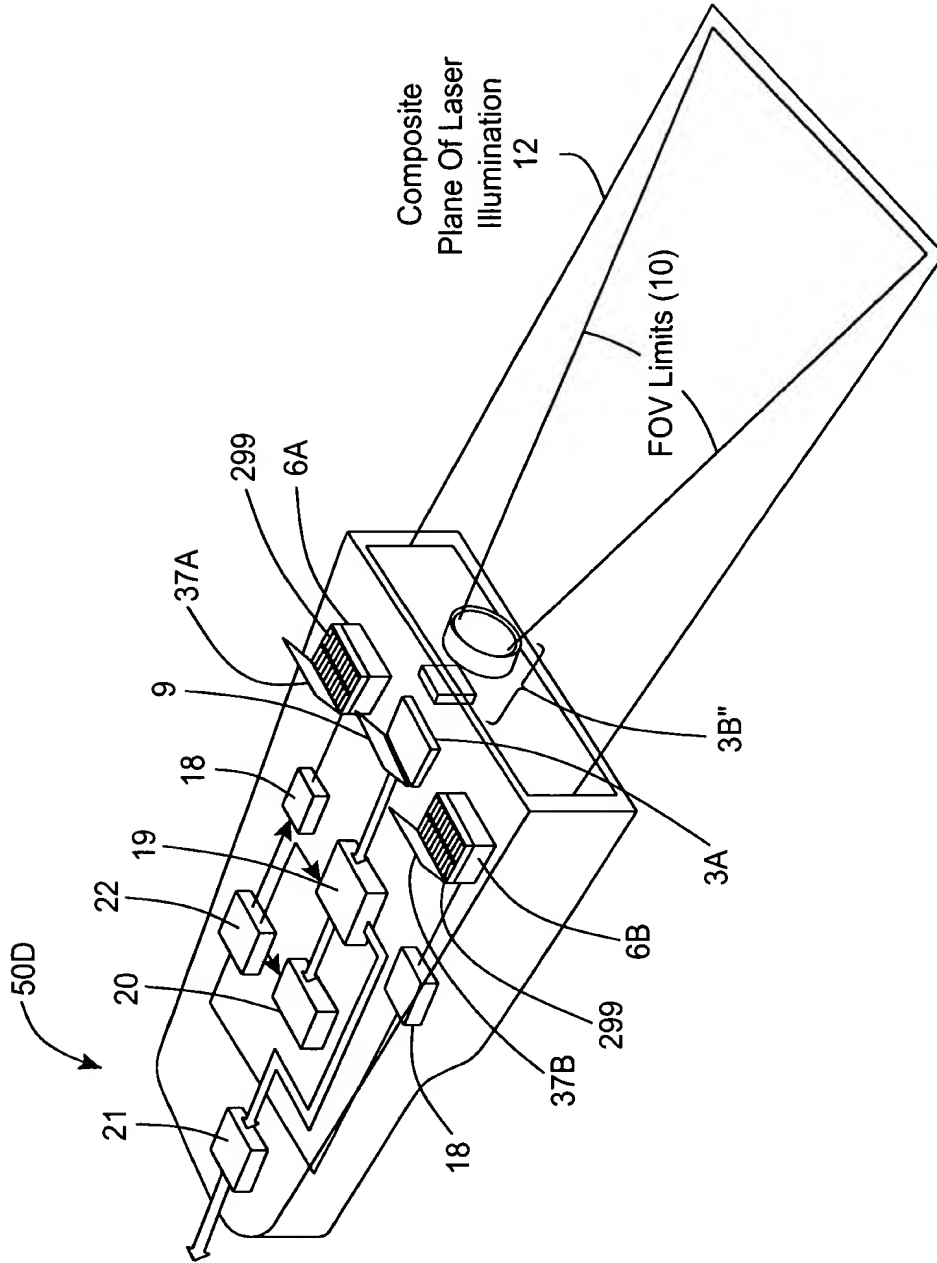


FIG. 3I

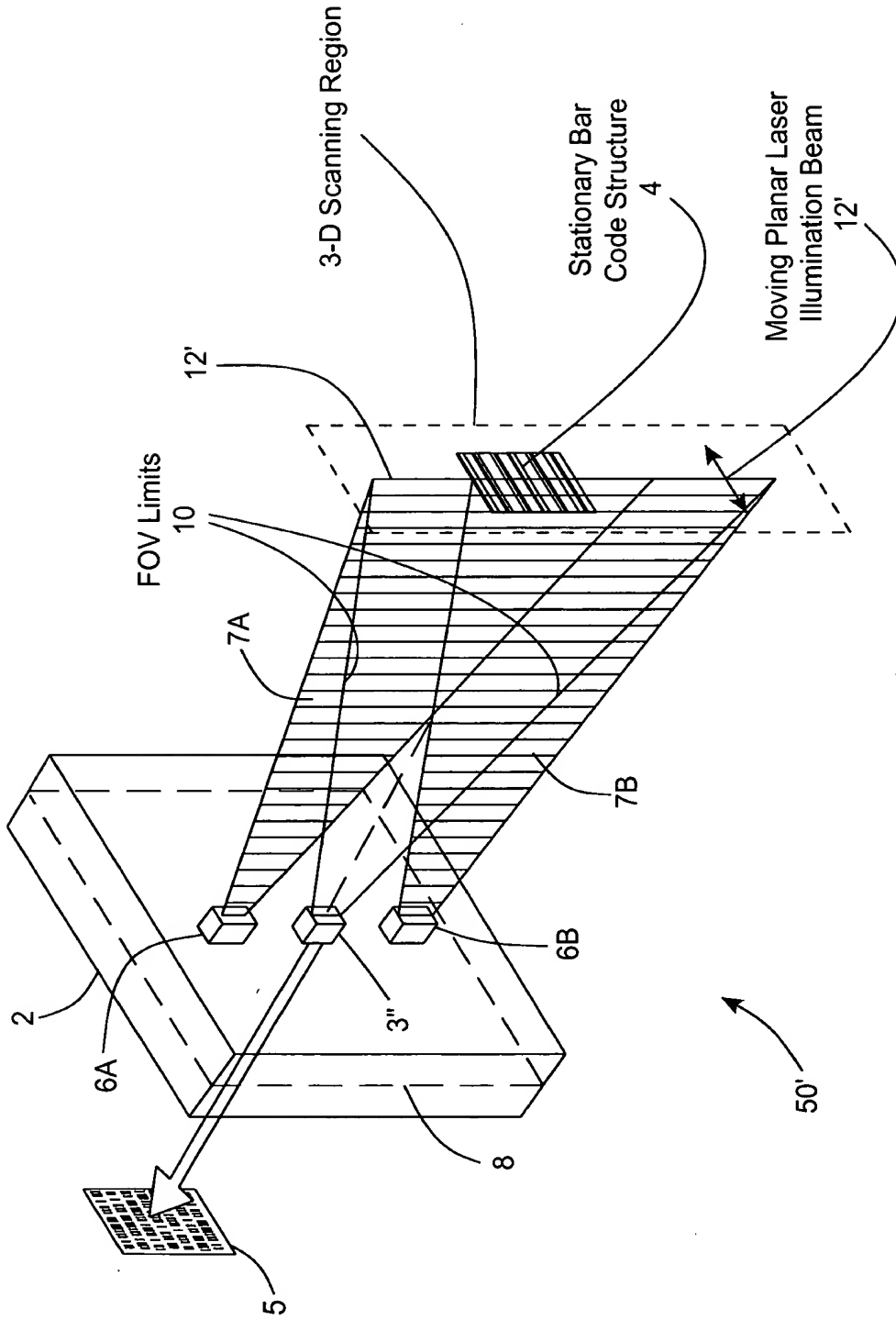


FIG. 3J1



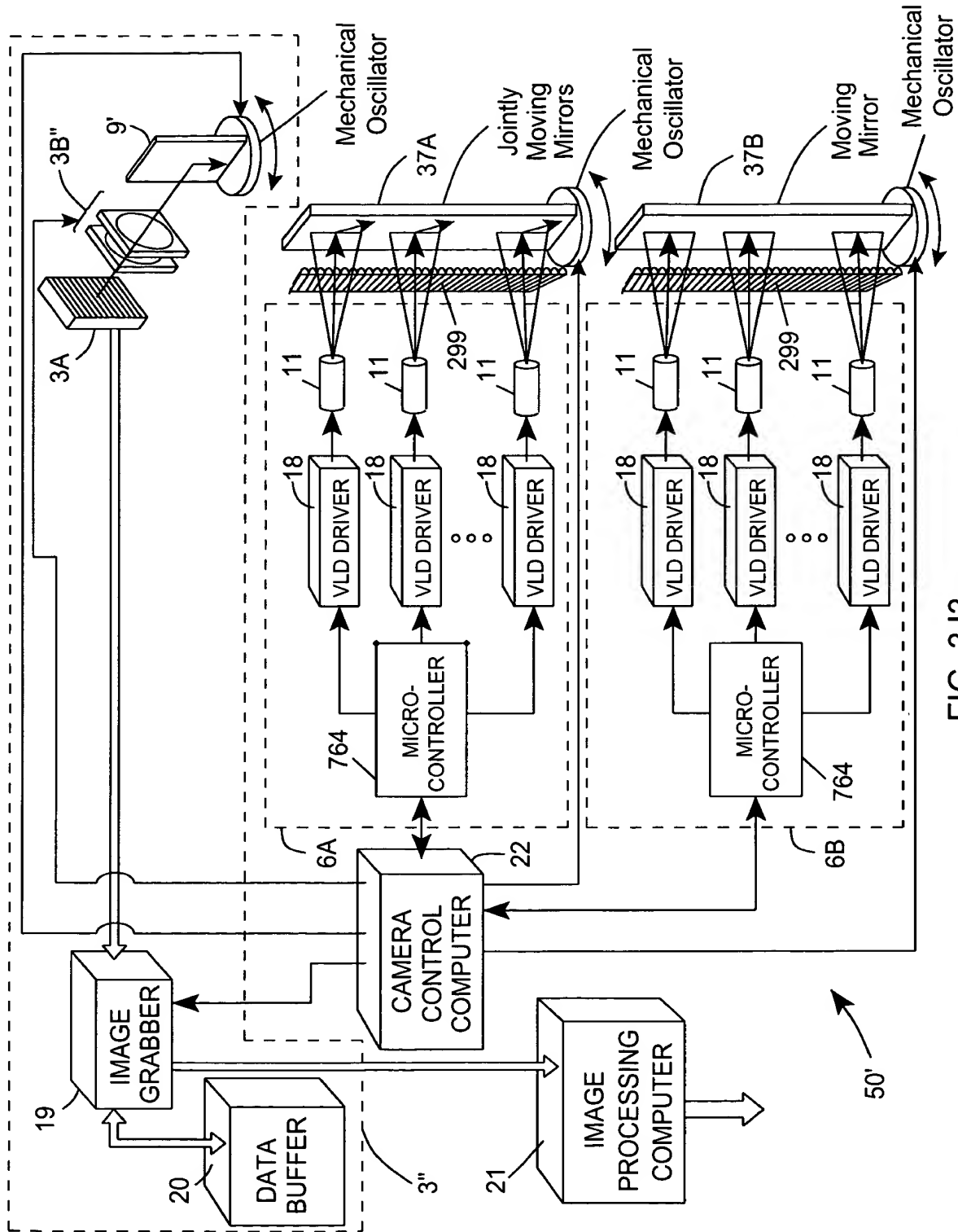


FIG. 3J3

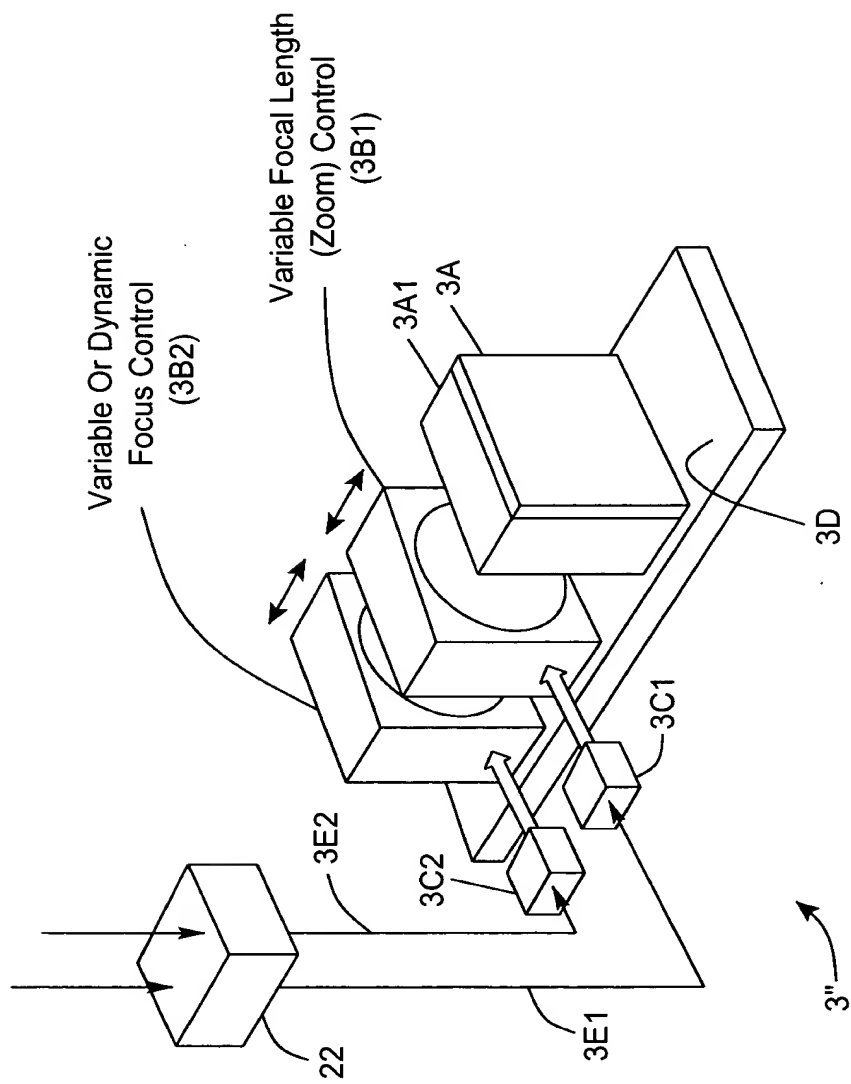
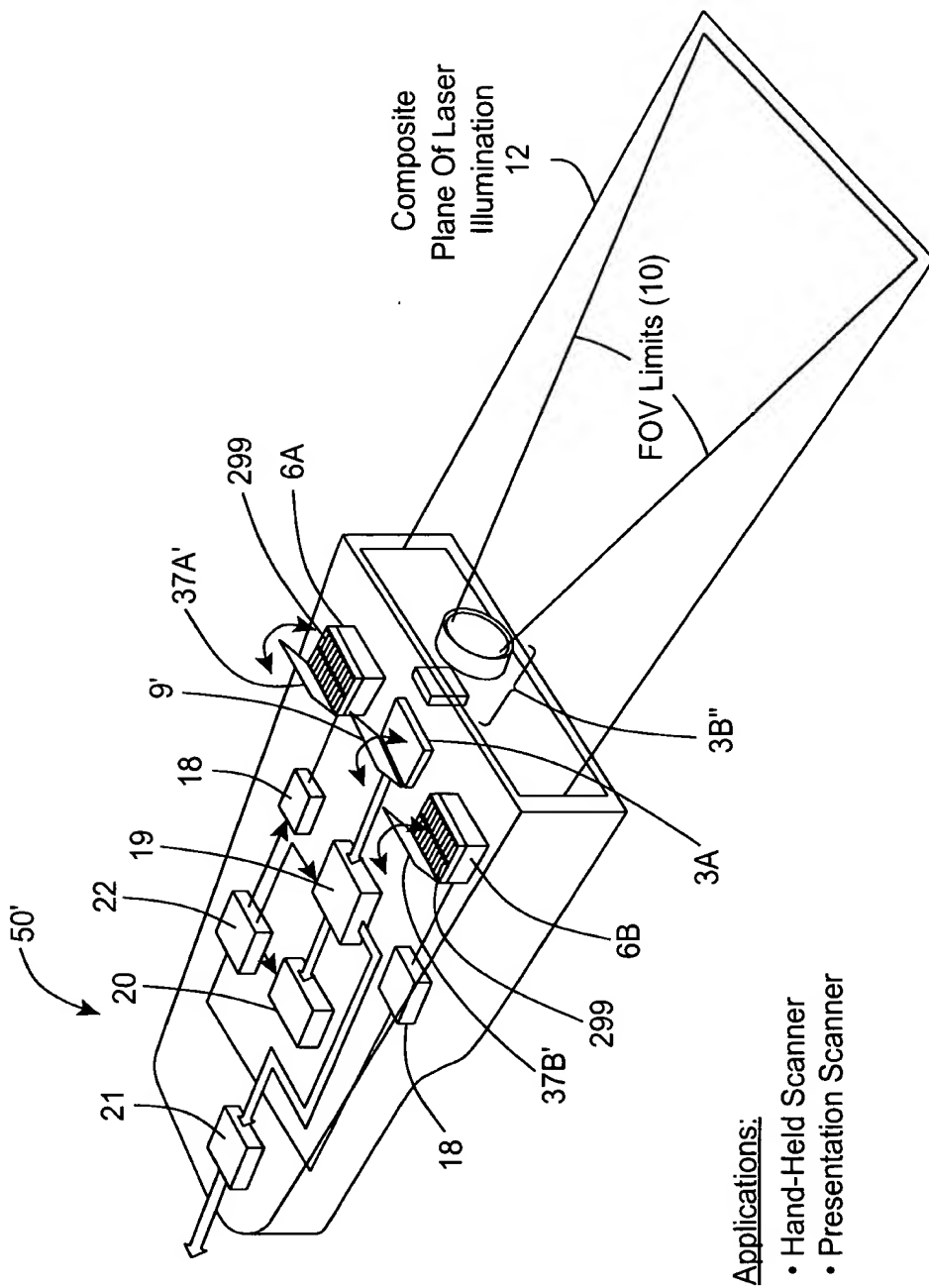
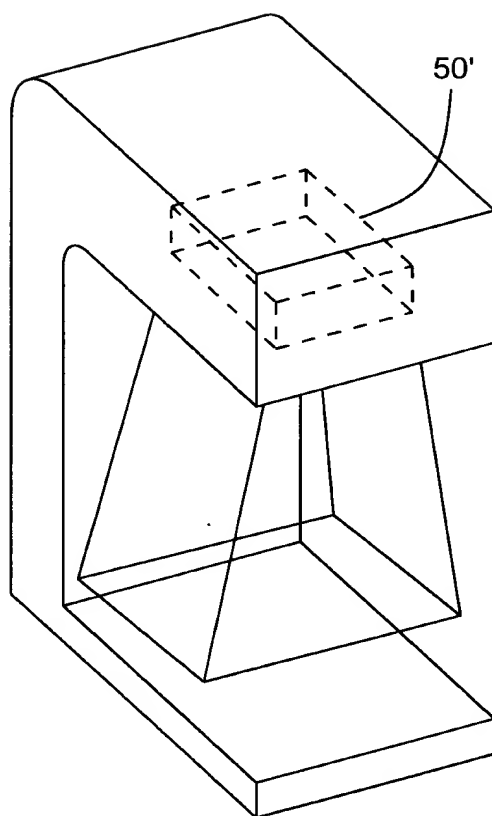


FIG. 3J4





2-D Hold-under Scanner

FIG. 3J6



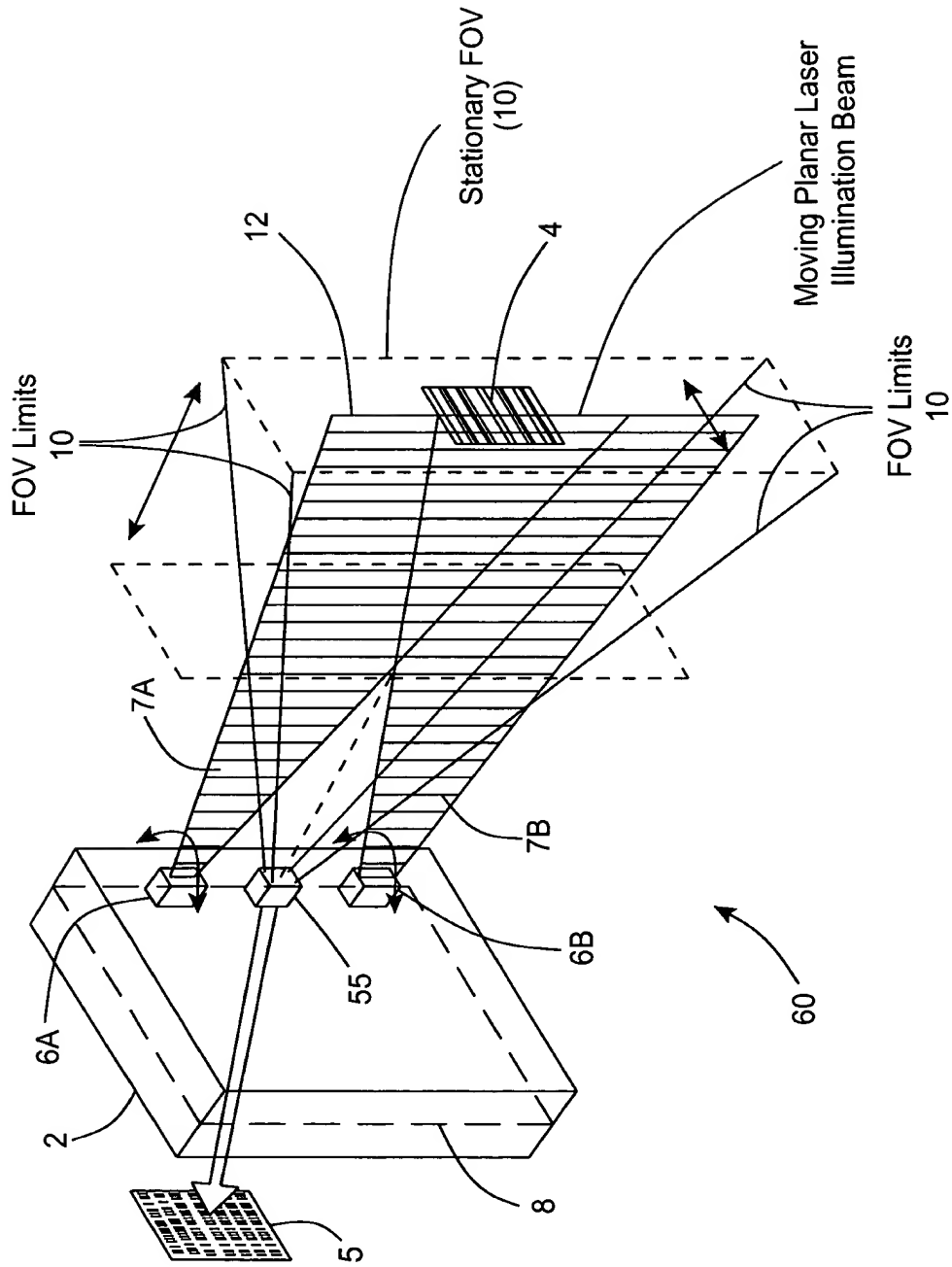


FIG. 4A

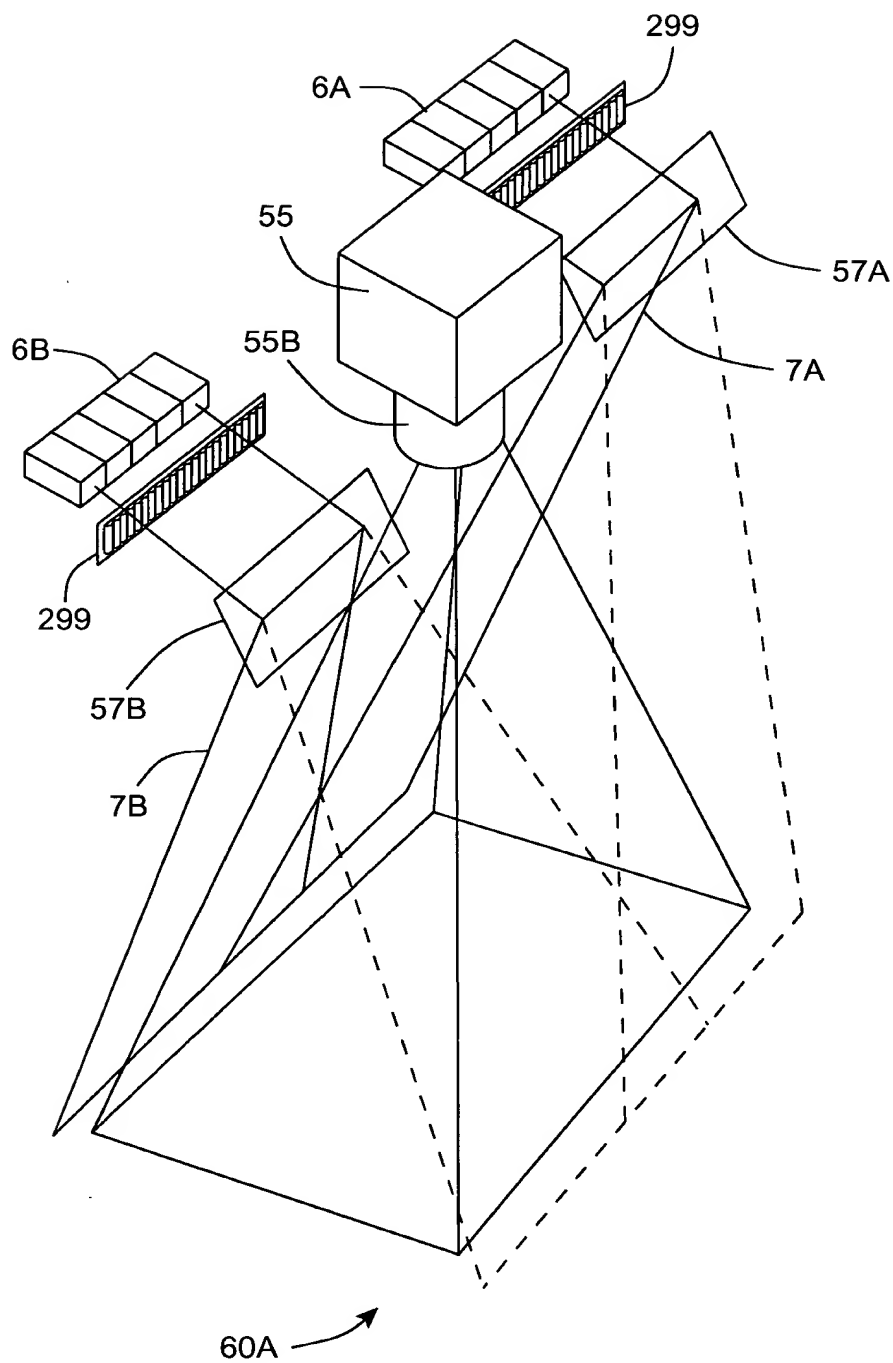


FIG. 4B1

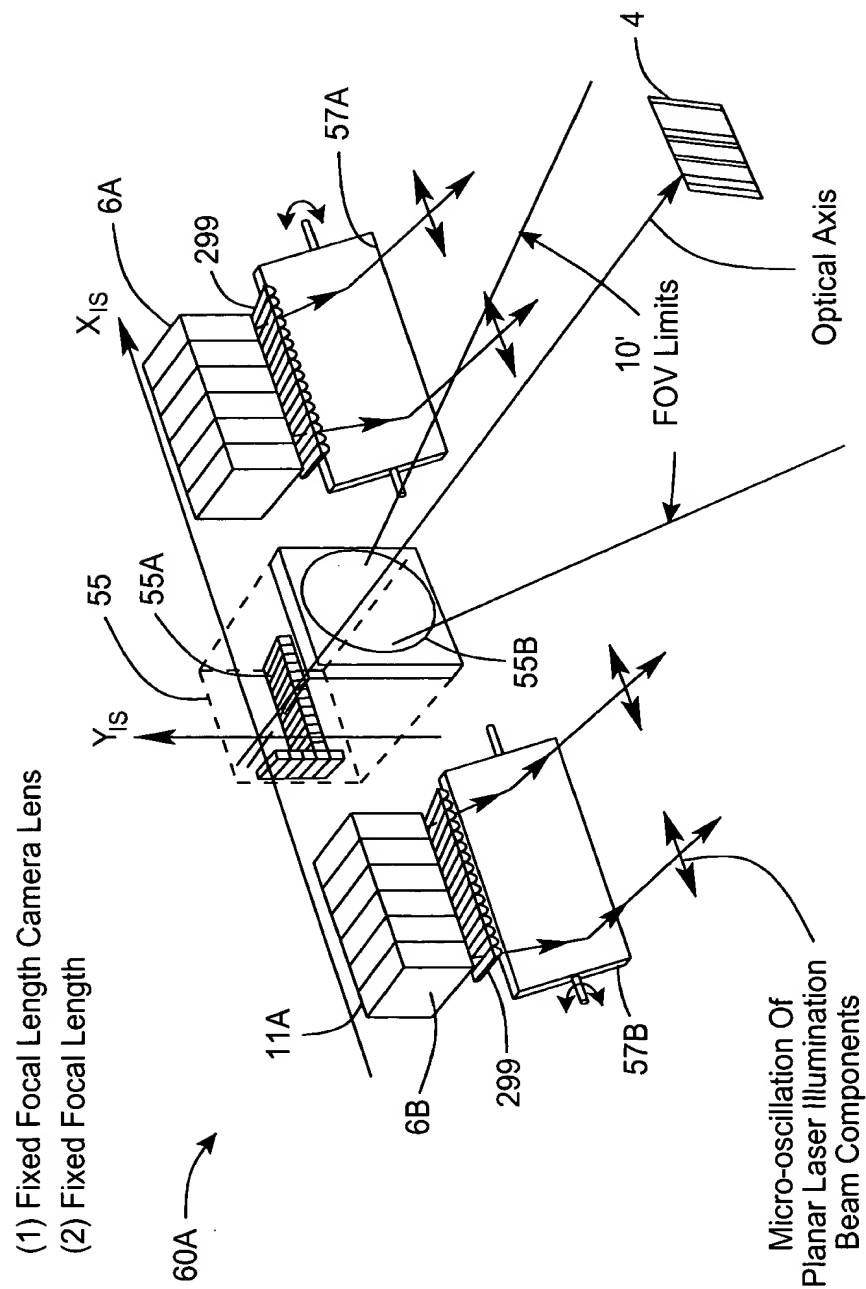
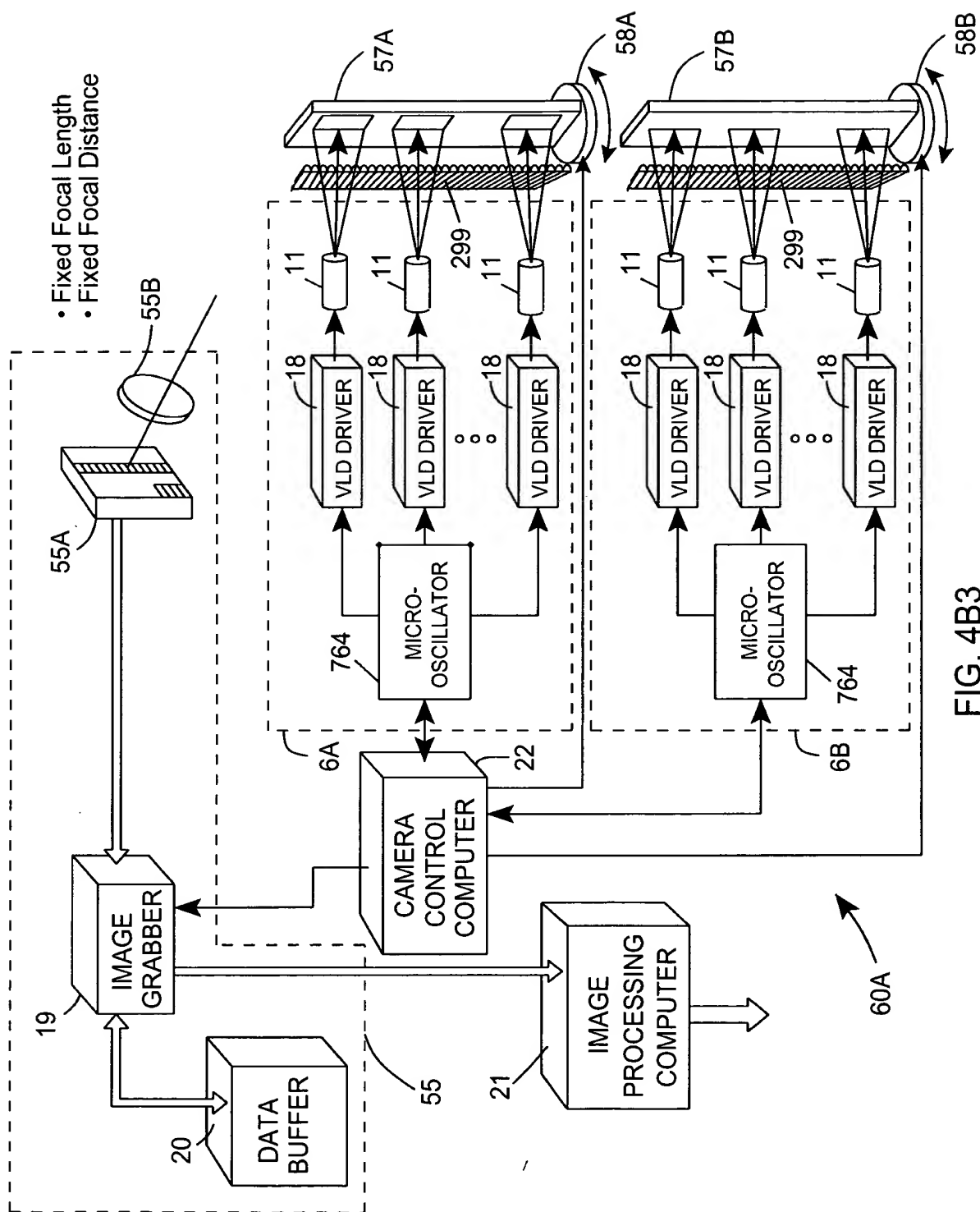


FIG. 4B2



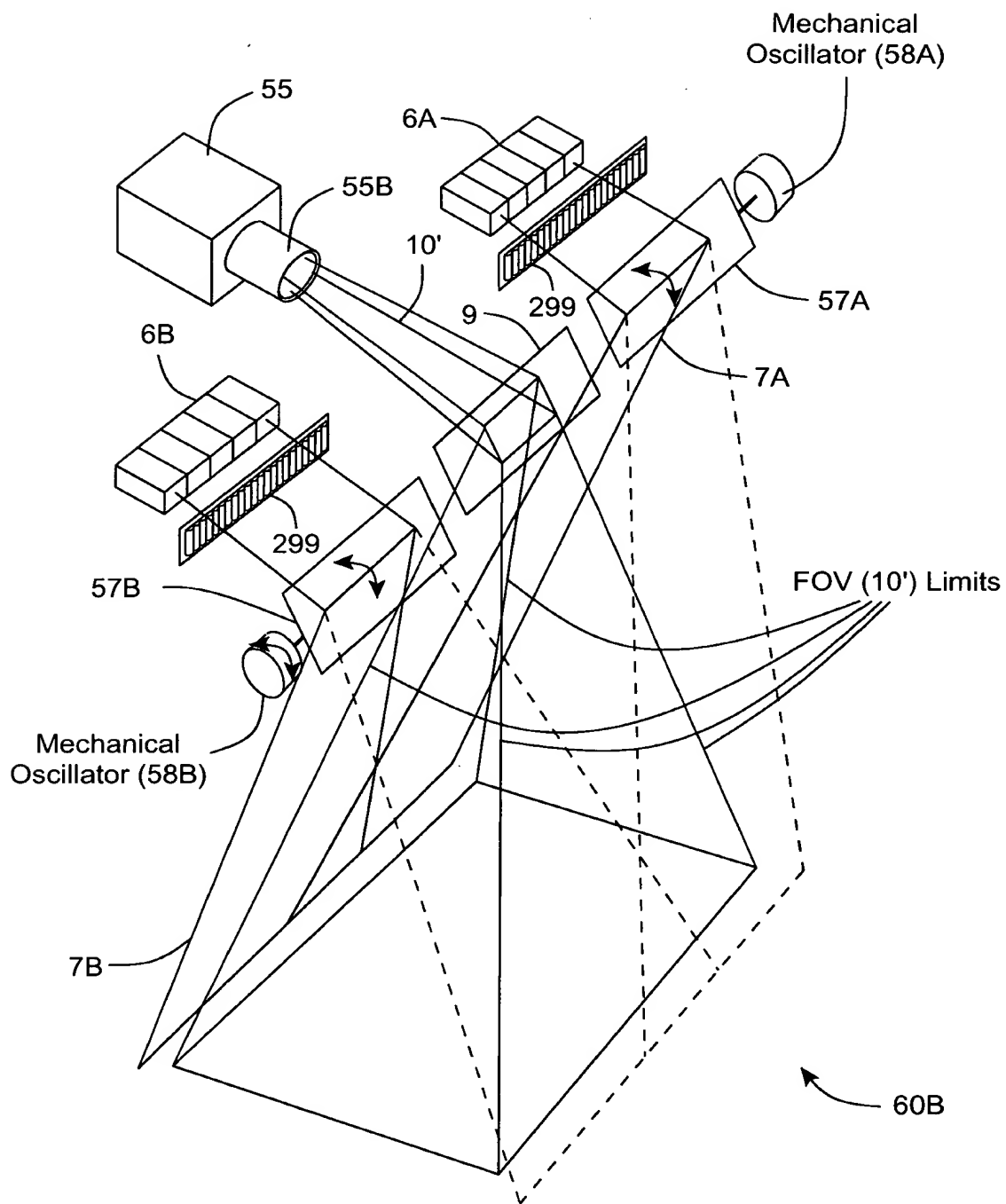


FIG. 4C1

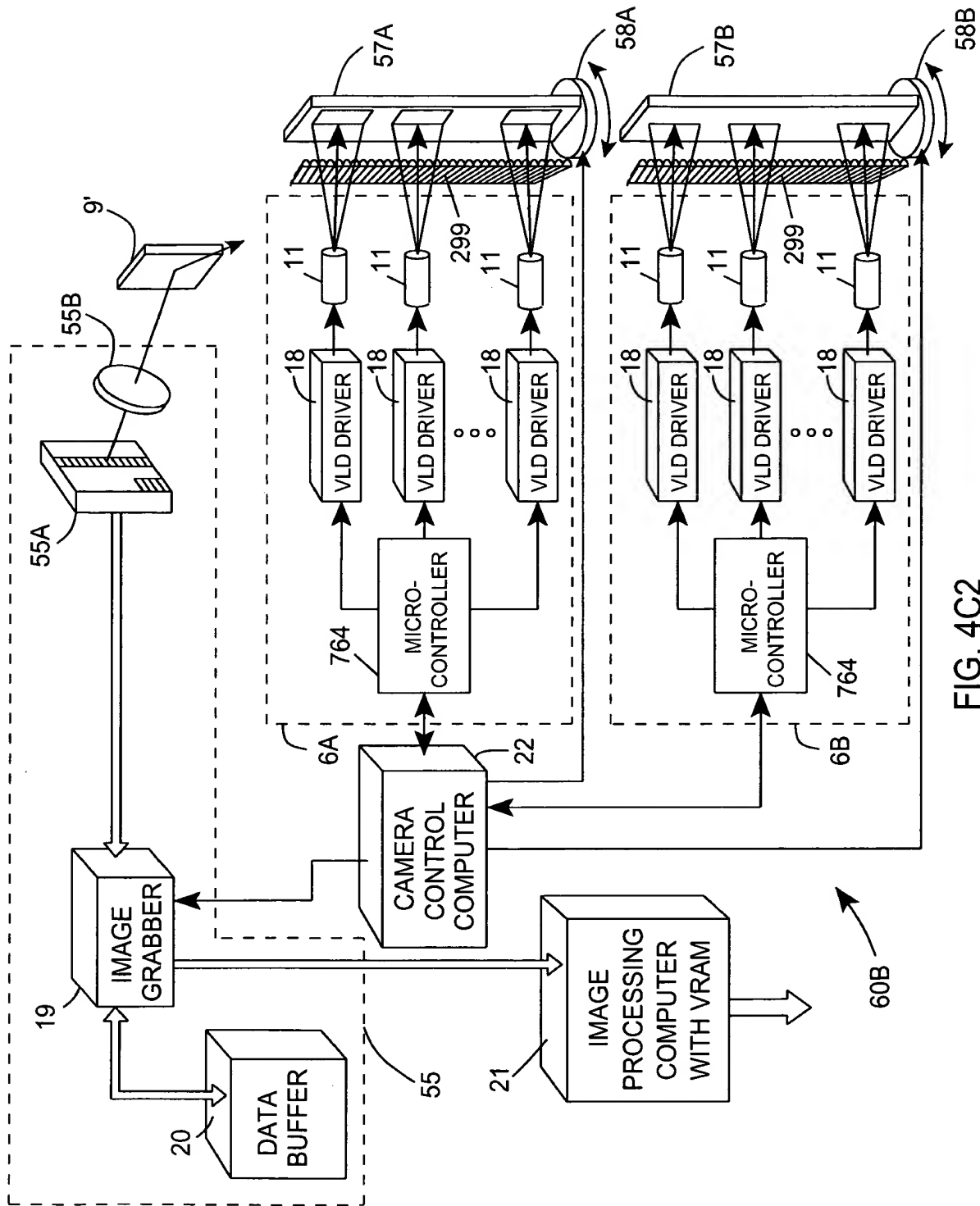
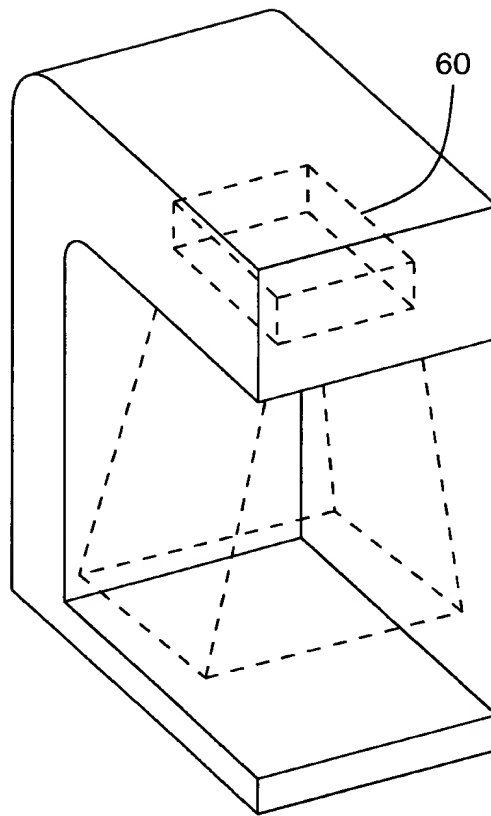
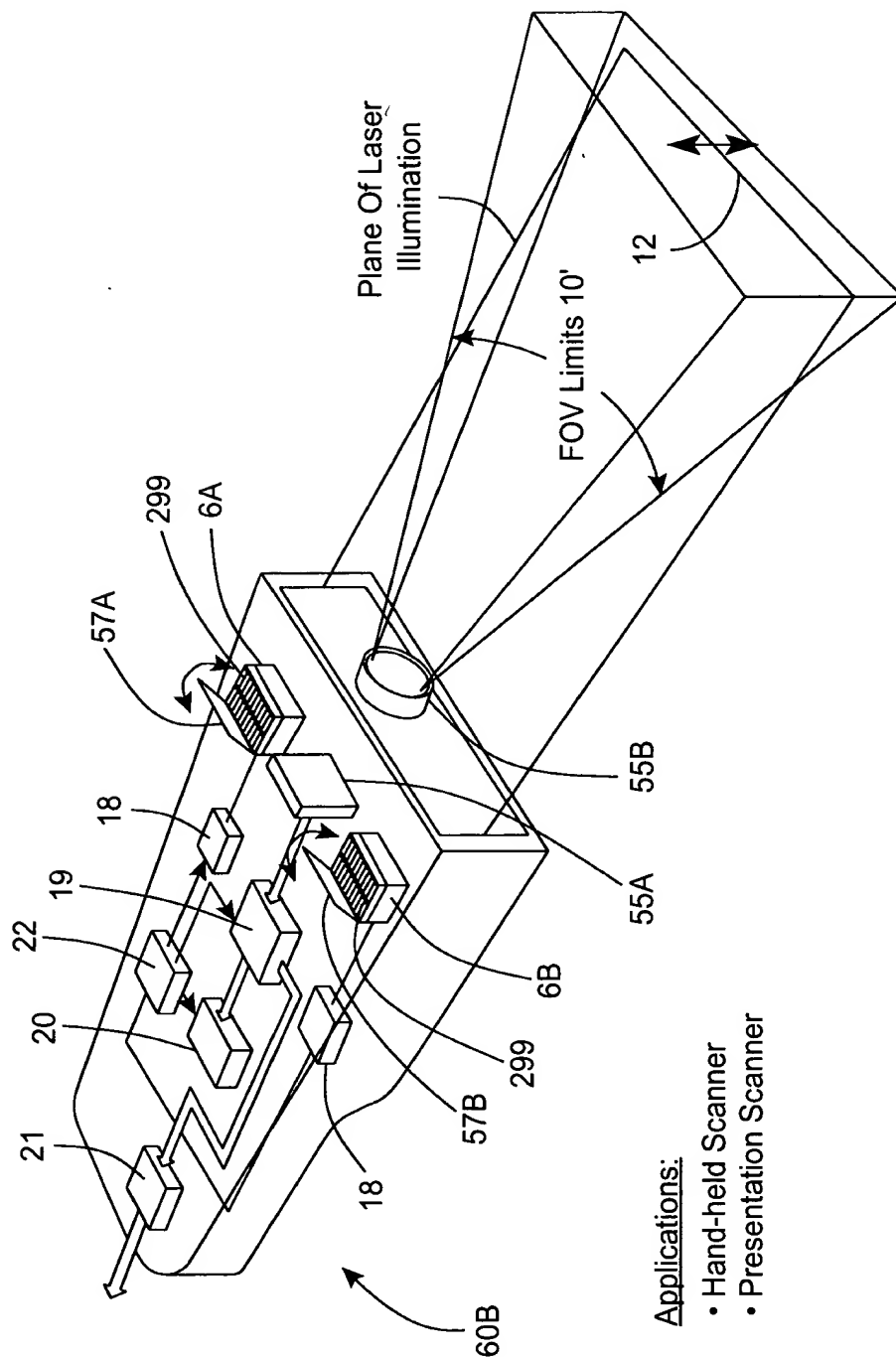


FIG. 4C2



2-D Hold-under Scanner

FIG. 4D





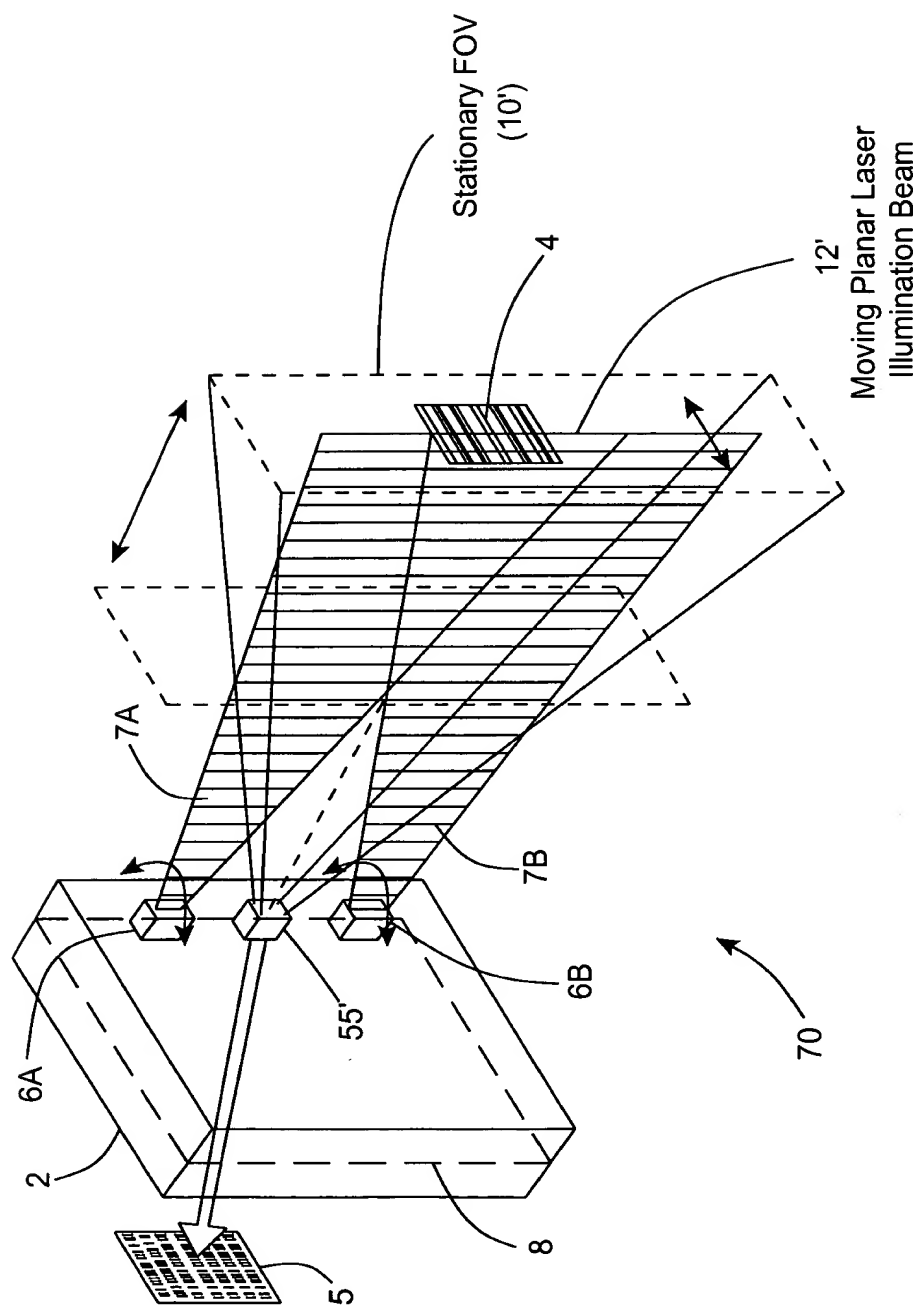


FIG. 5A

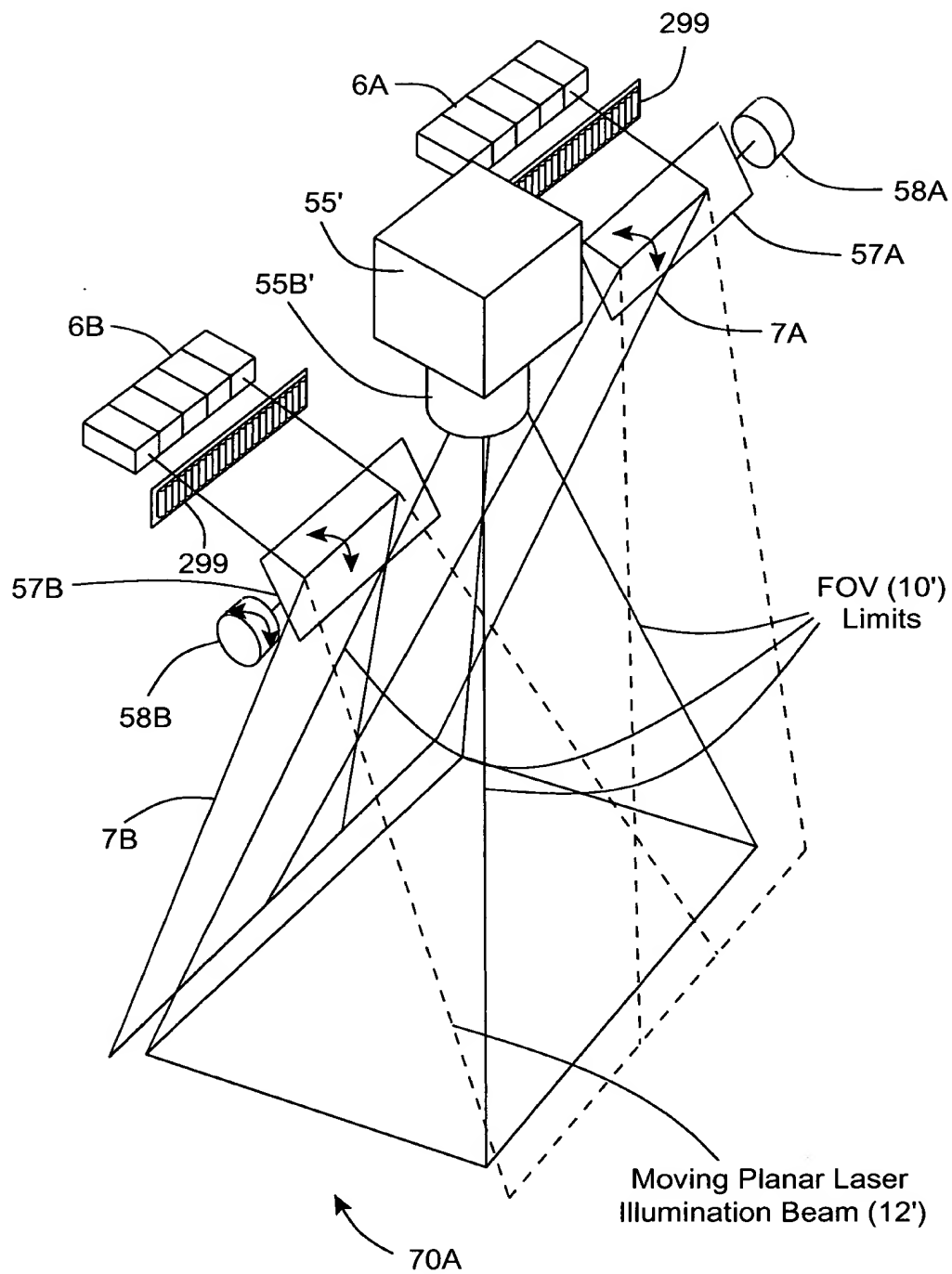


FIG. 5B1

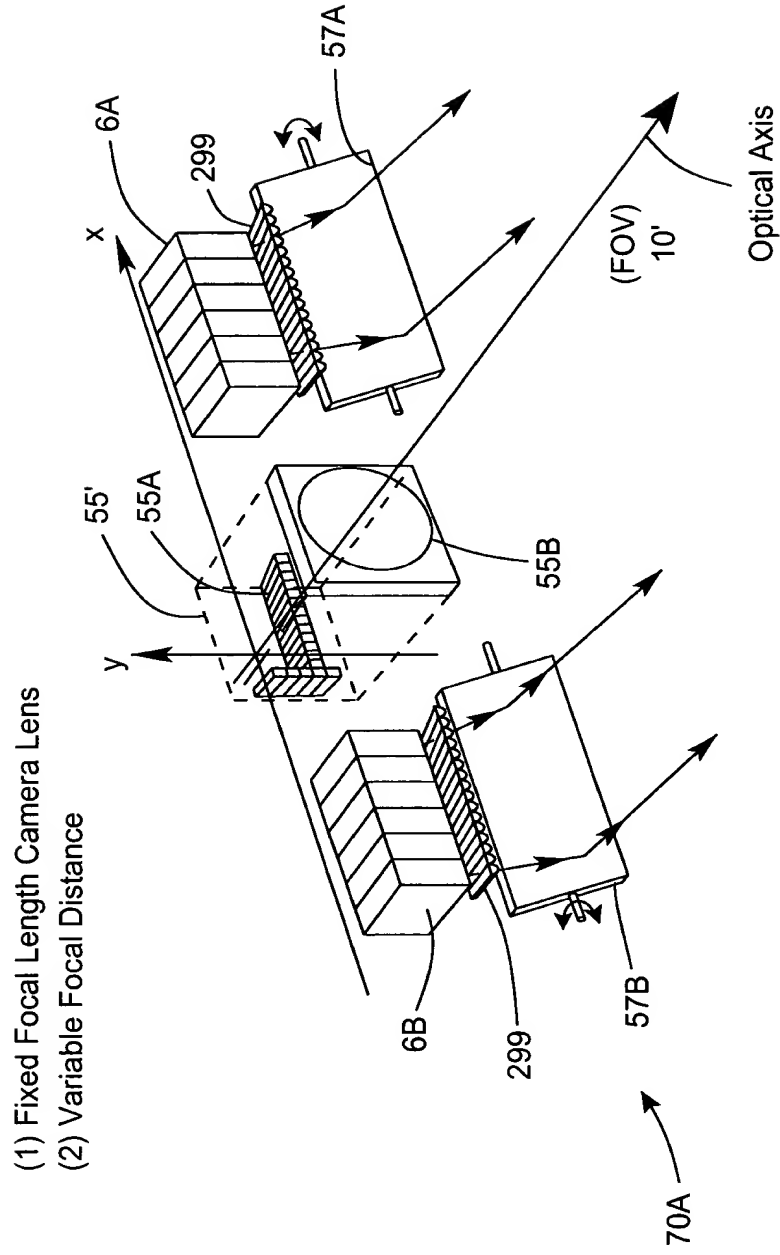


FIG. 5B2



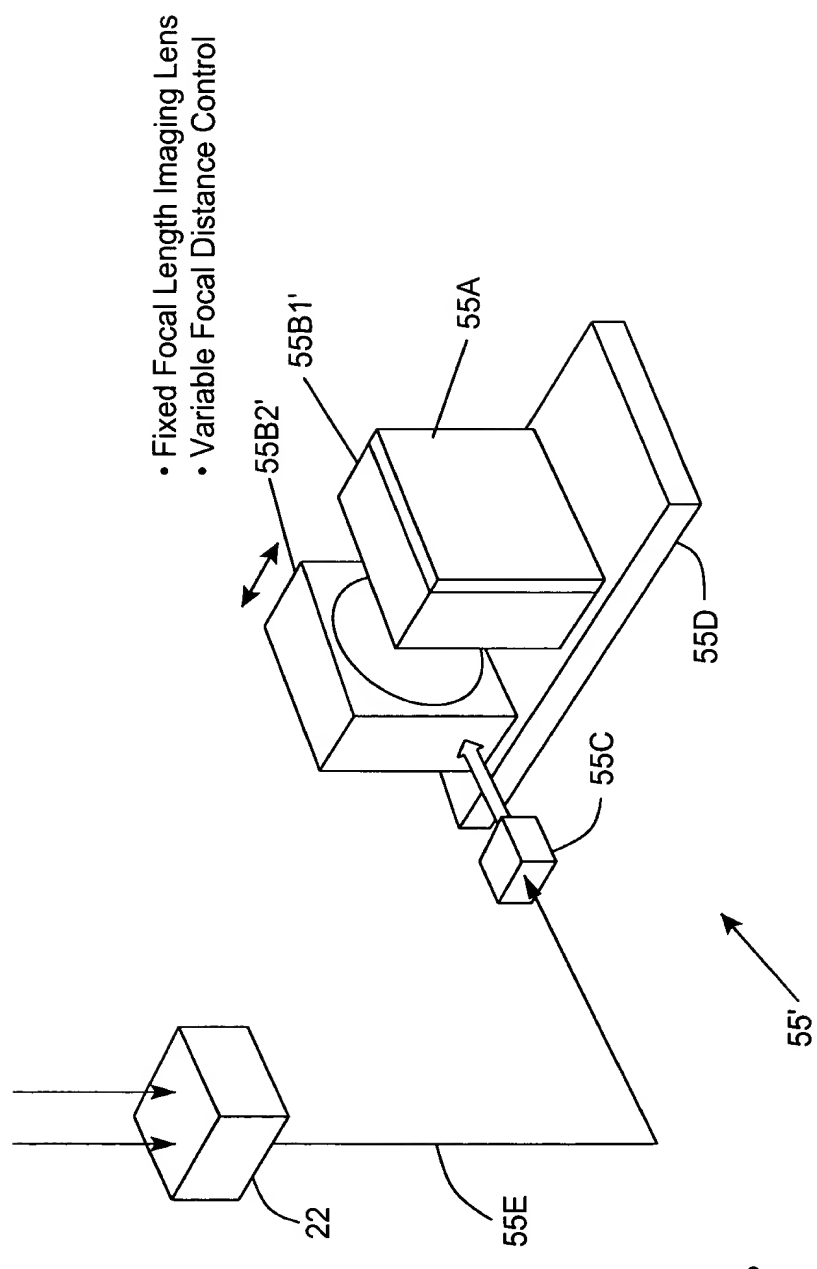


FIG. 5B4

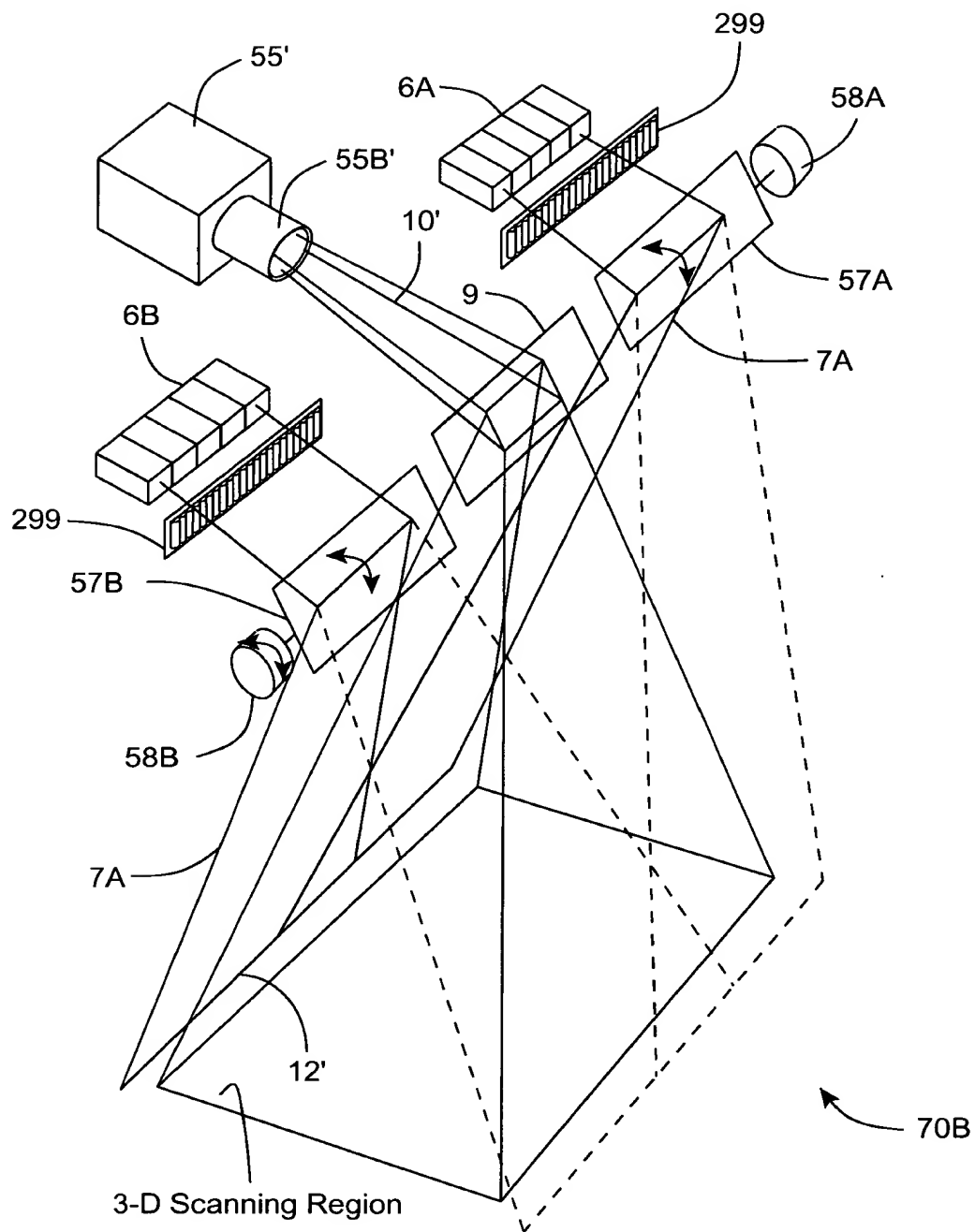


FIG. 5C1

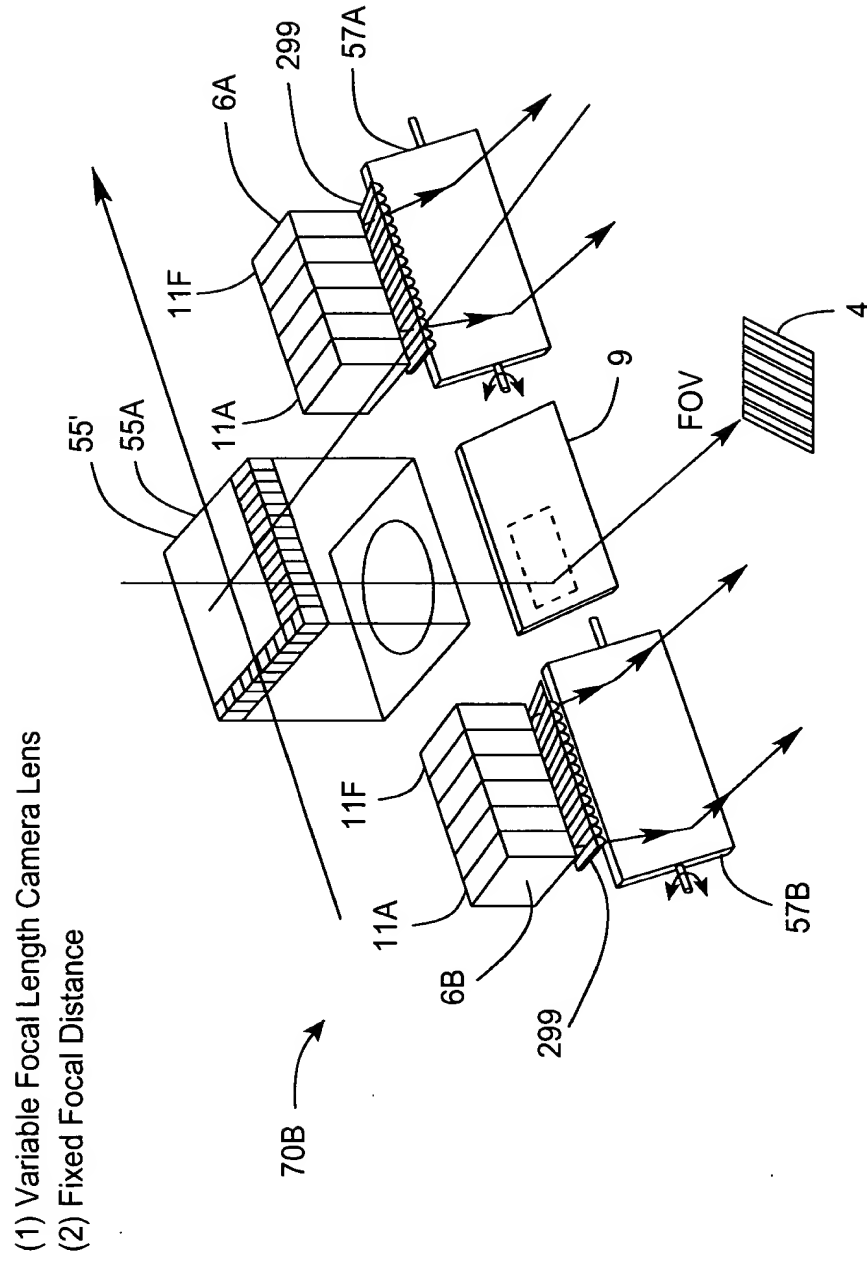
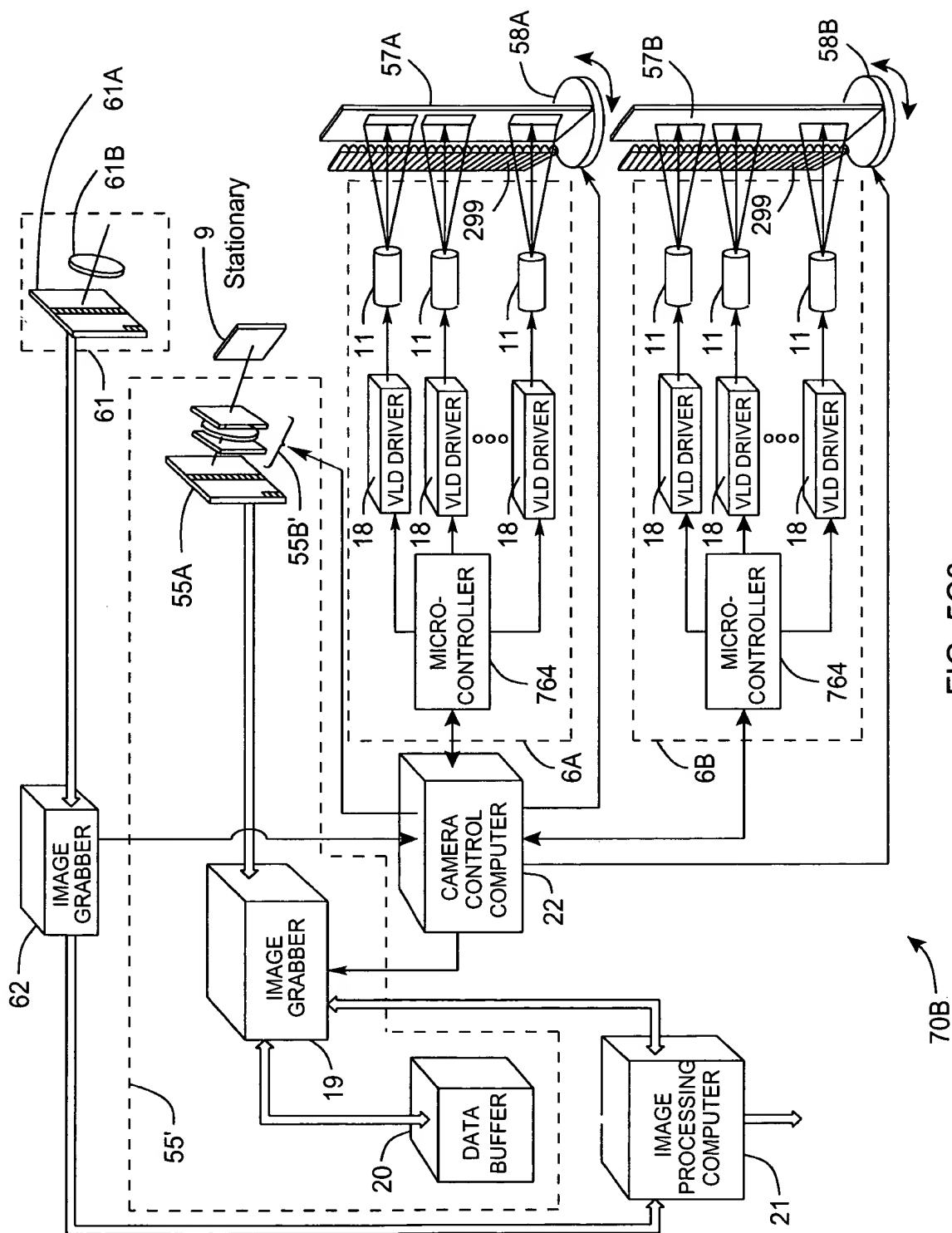


FIG. 5C2



**FIG. 5C3**



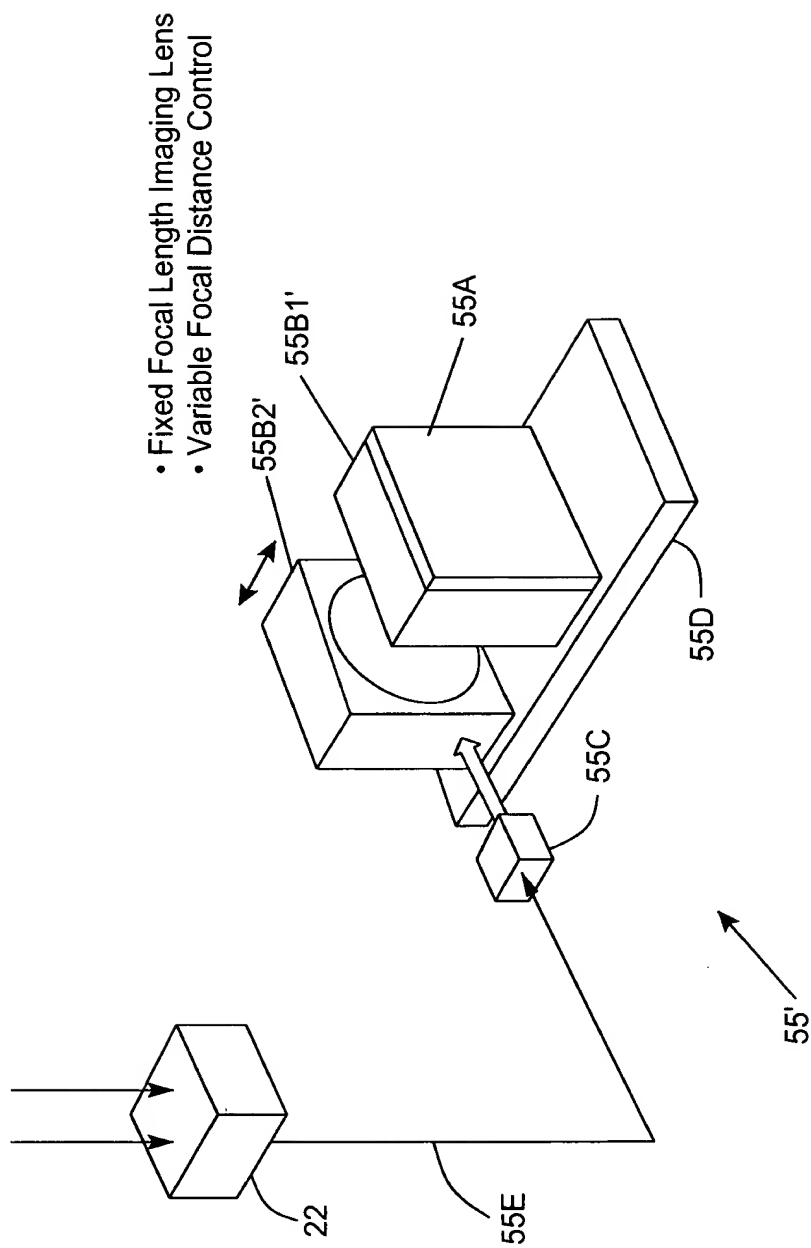


FIG. 5C4

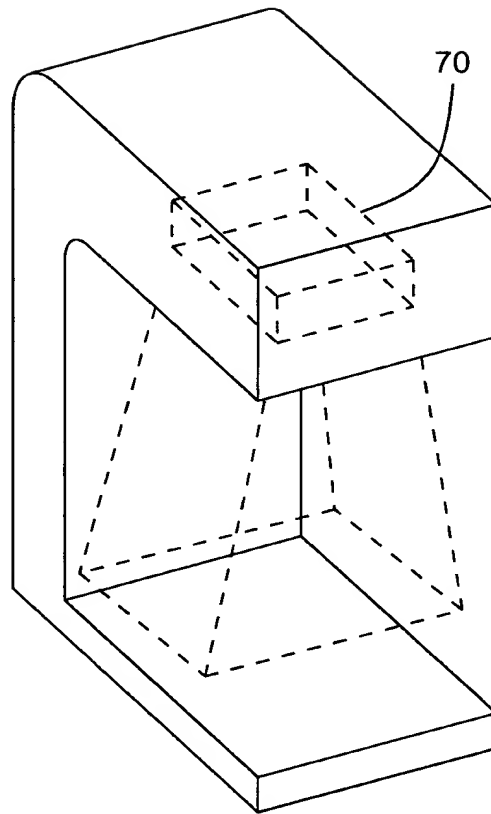


FIG. 5D

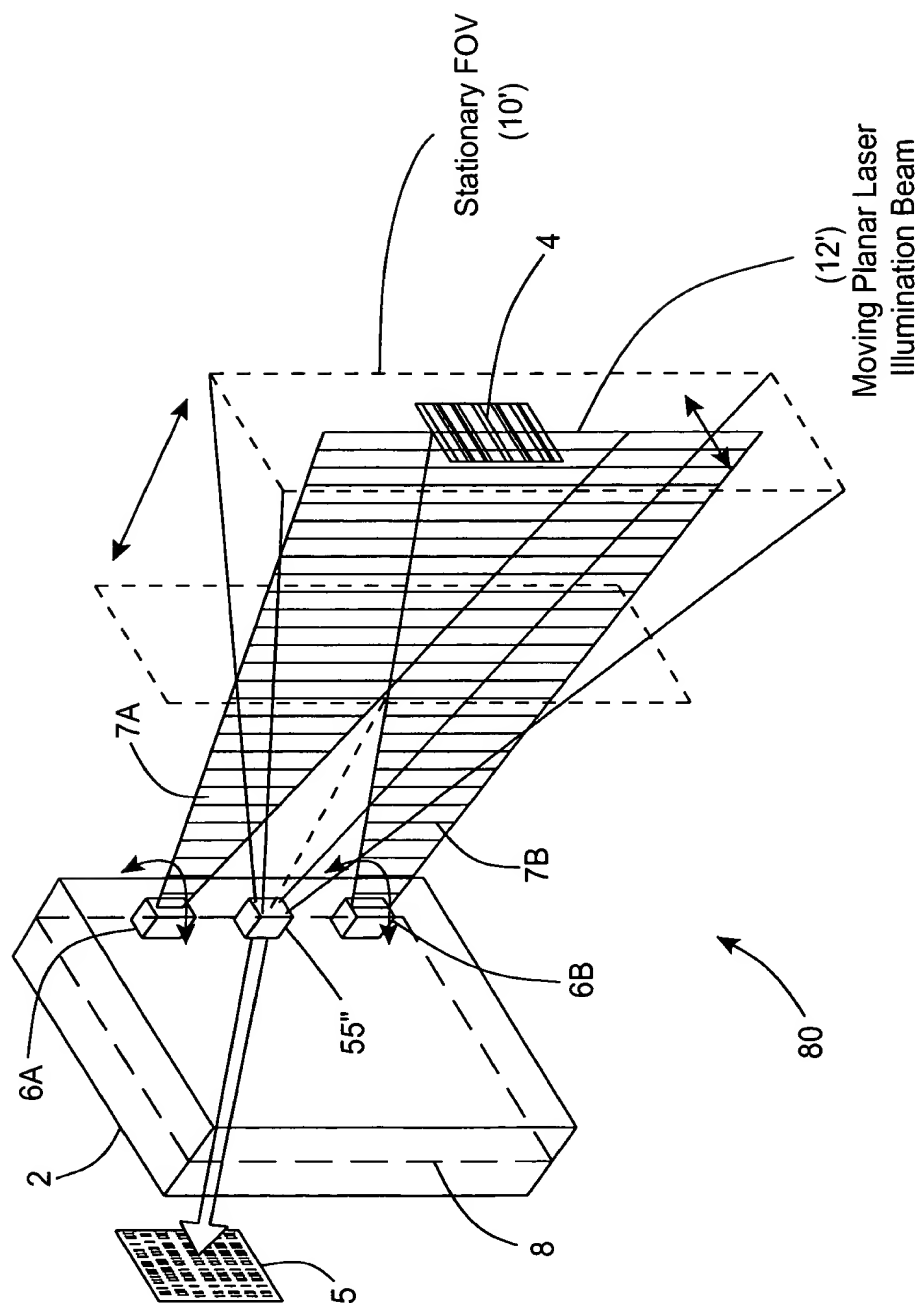


FIG. 6A

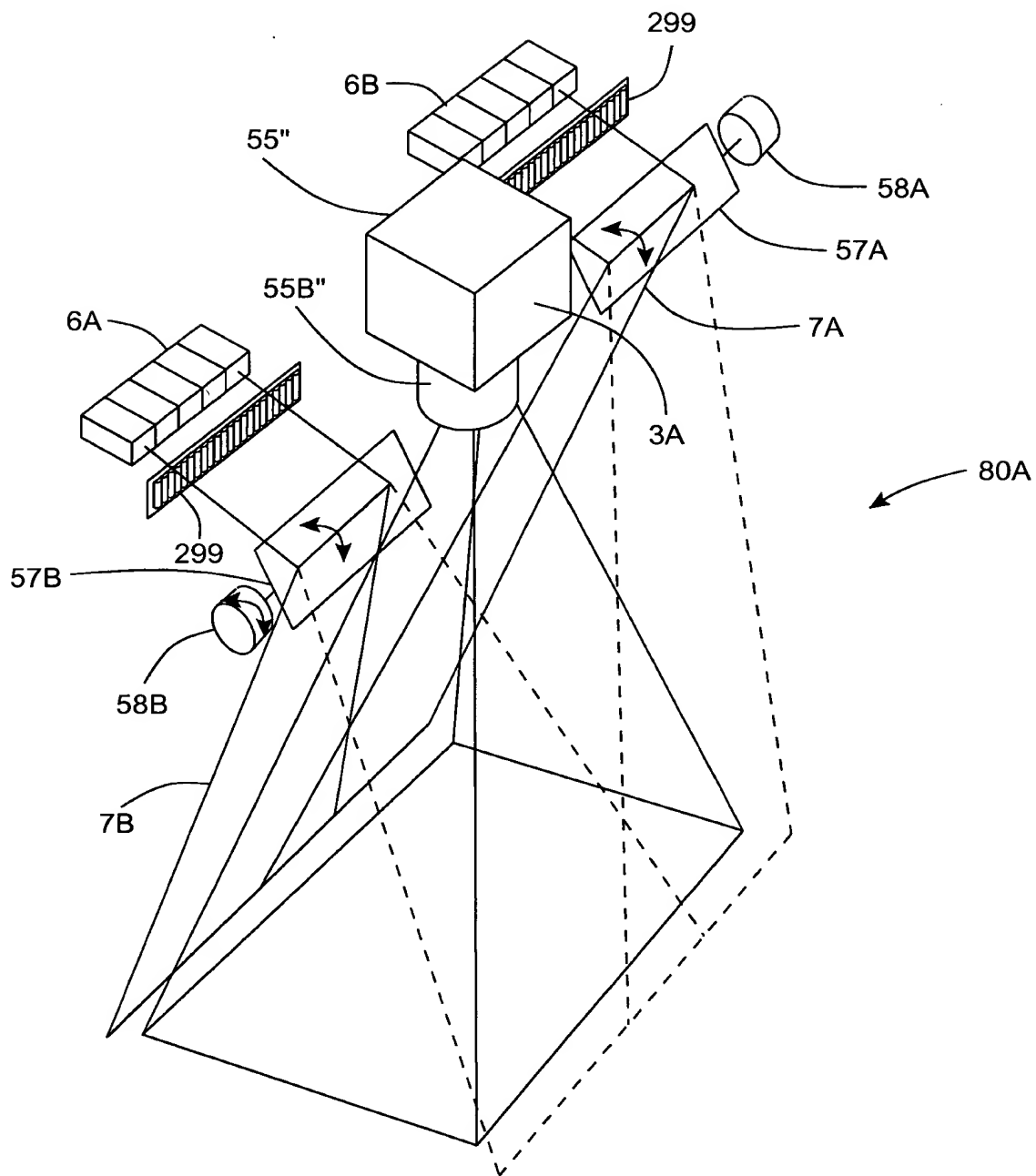


FIG. 6B1

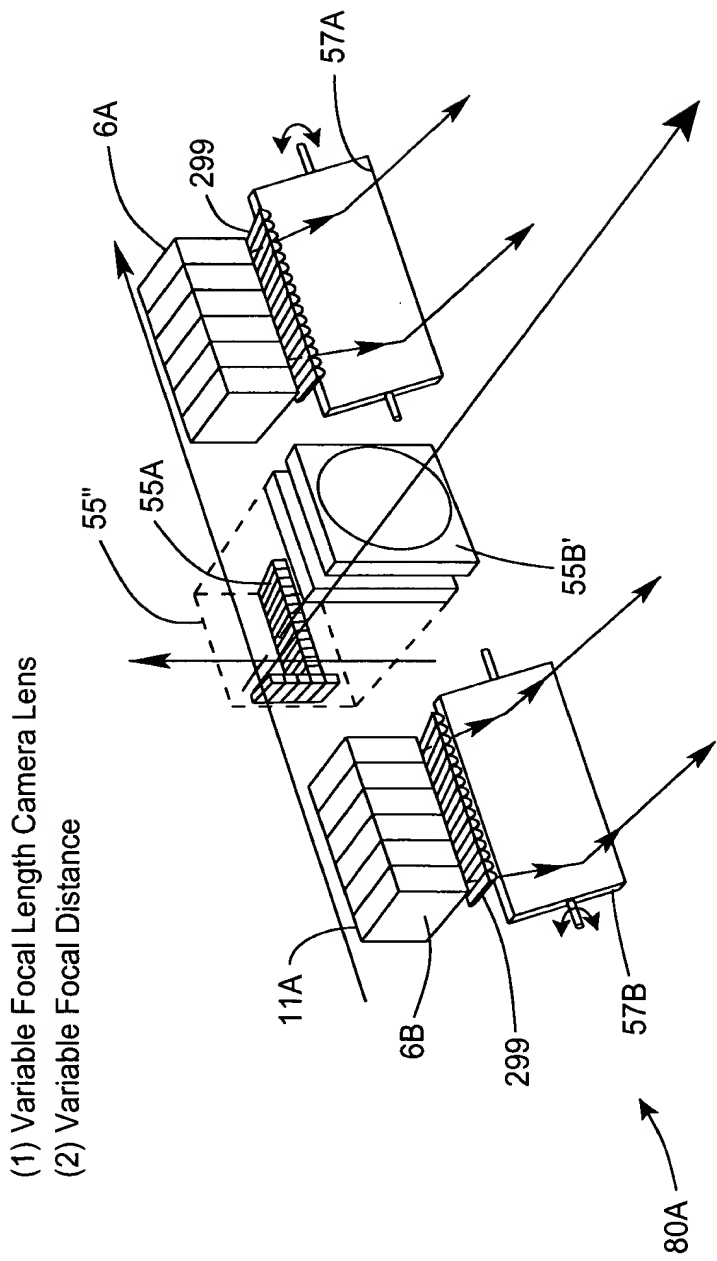


FIG. 6B2

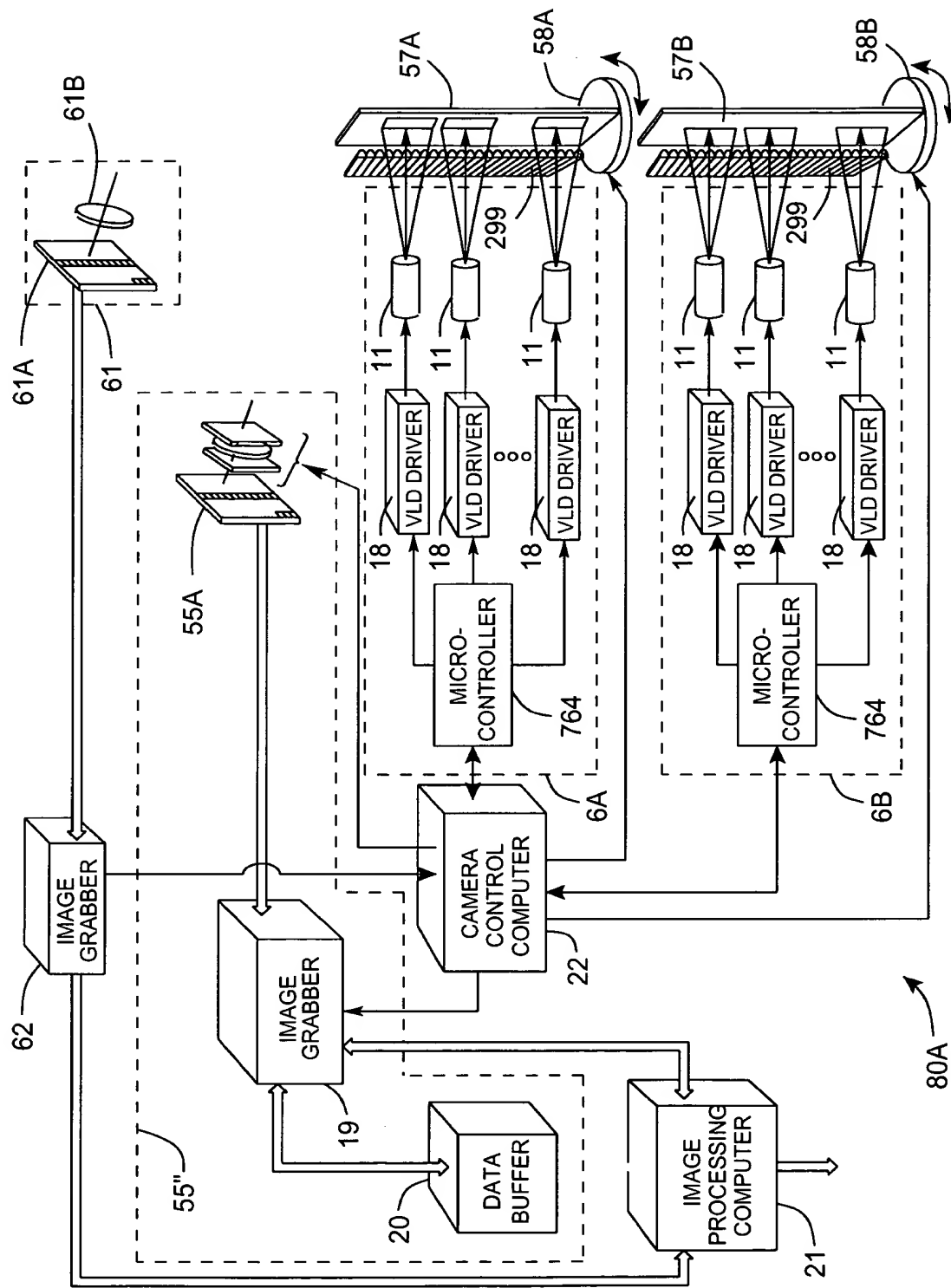


FIG. 6B3

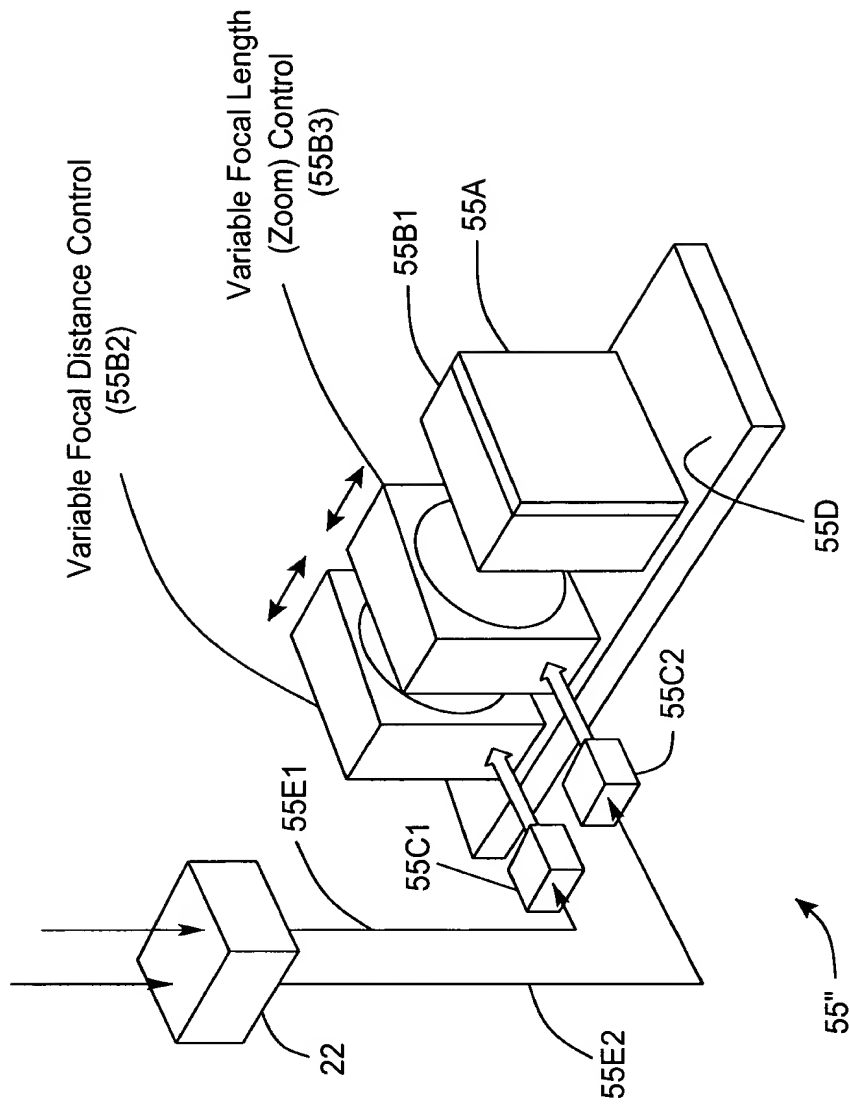


FIG. 6B4

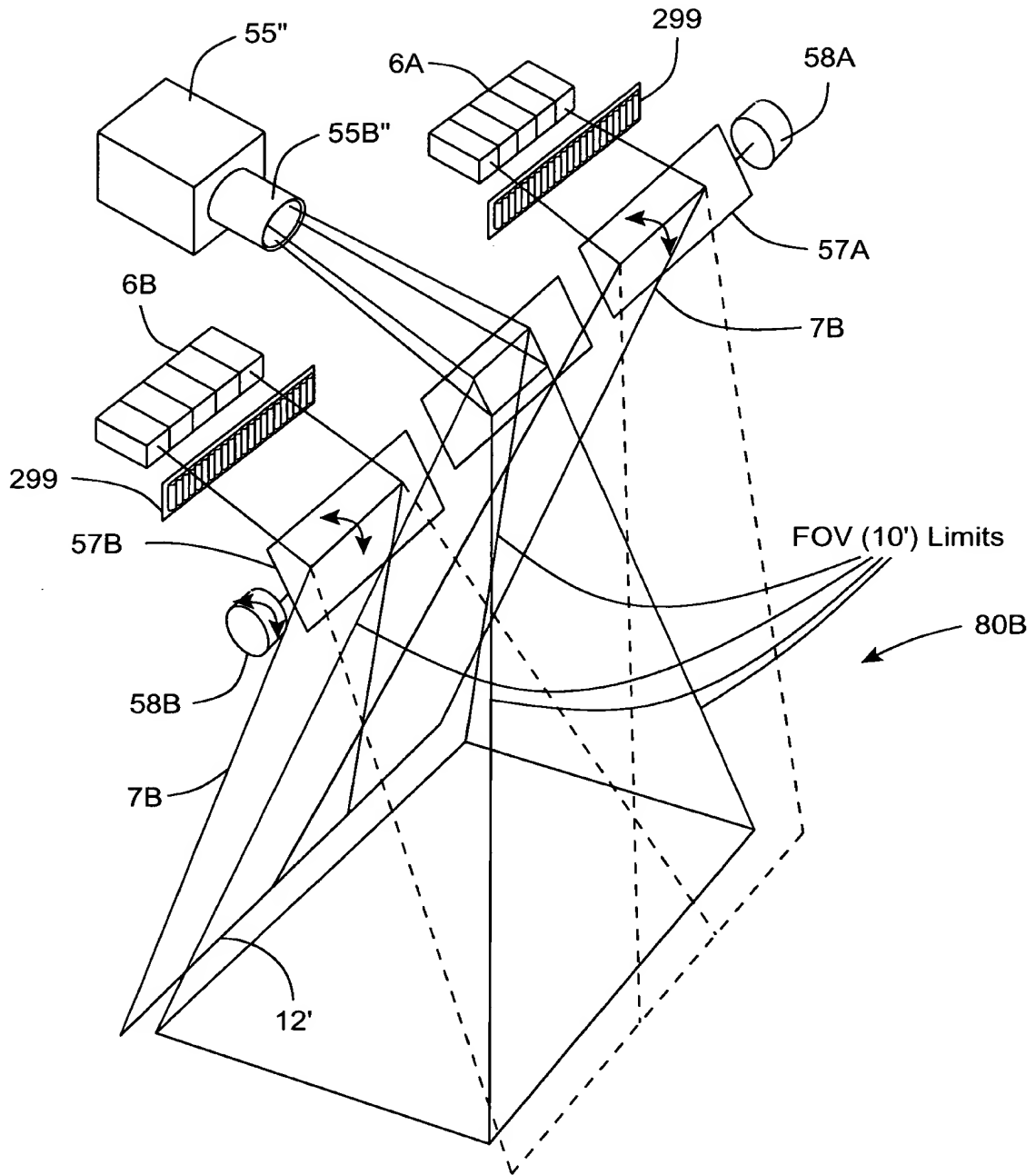
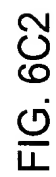


FIG. 6C1





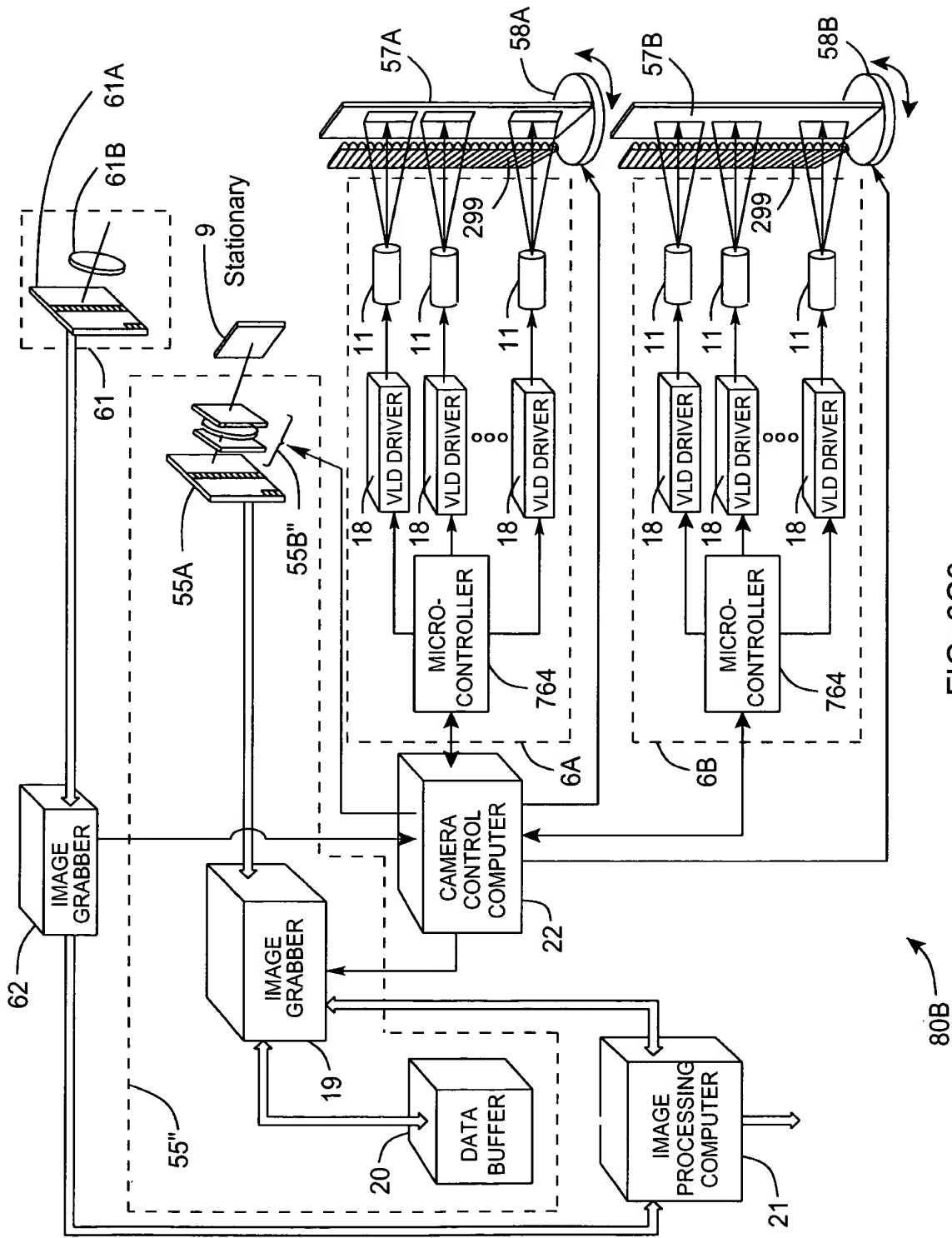


FIG. 6C3

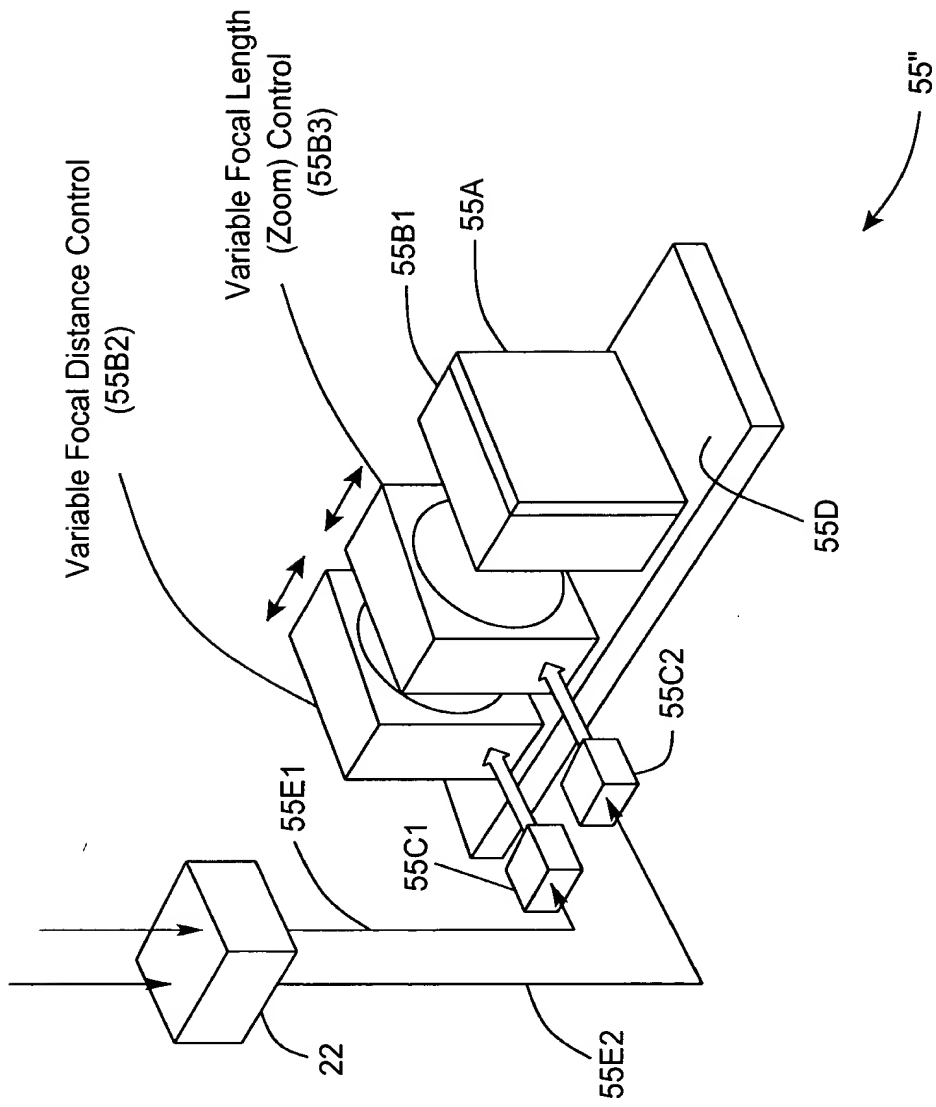


FIG. 6C4

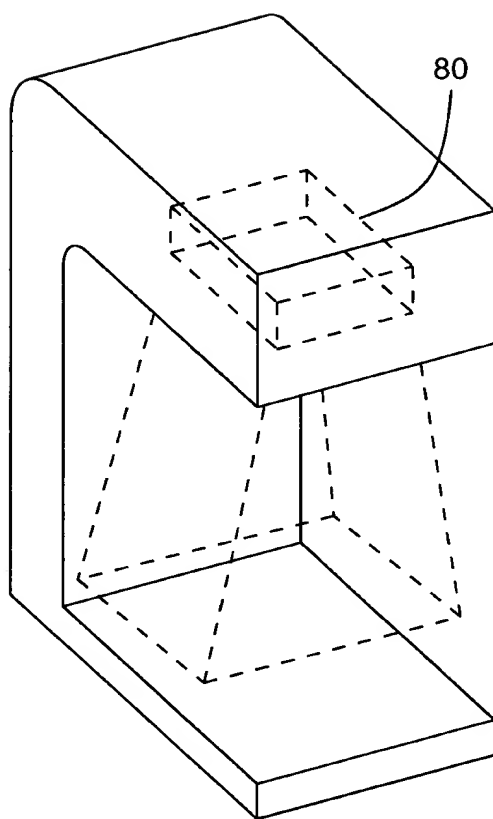


FIG. 6C5

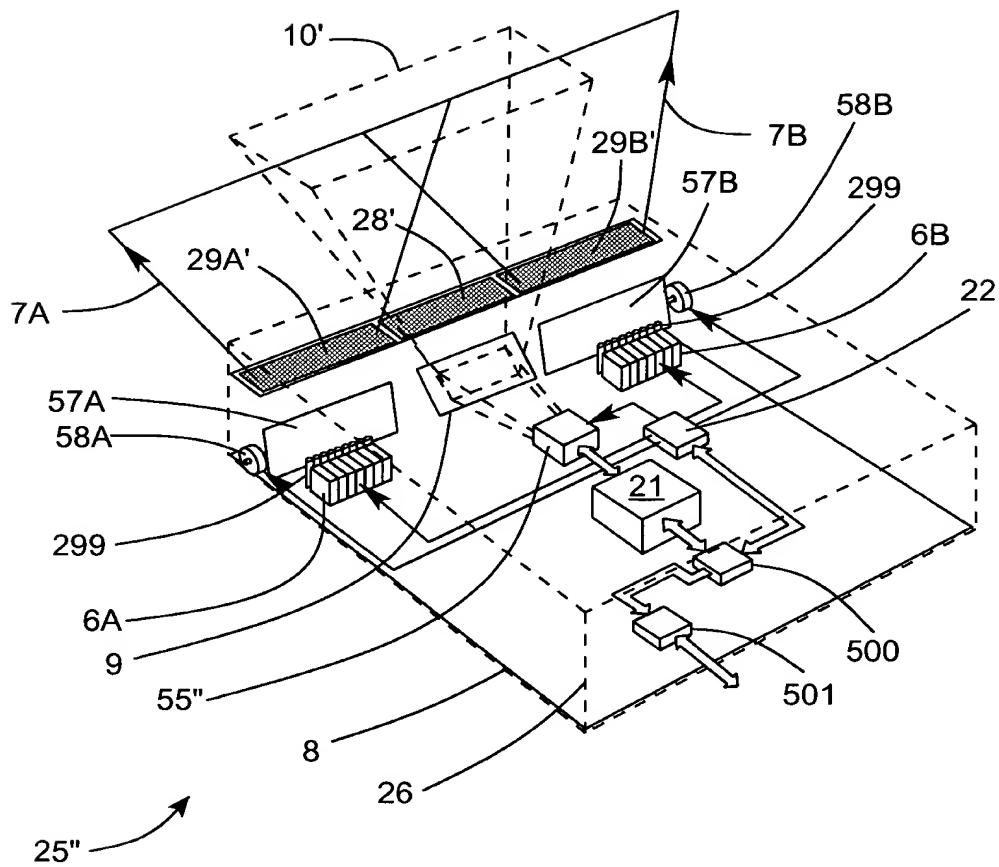


FIG. 6D1

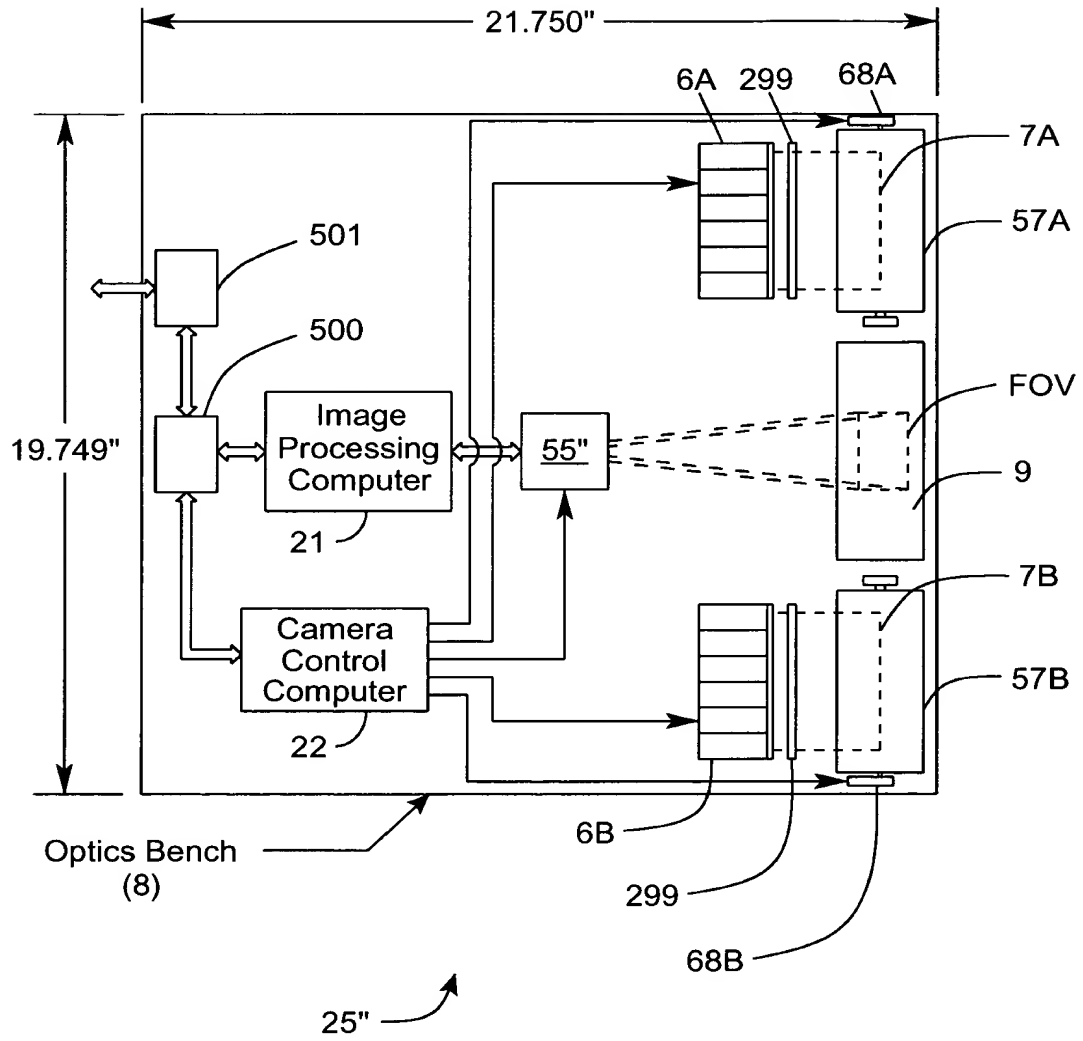


FIG. 6D2

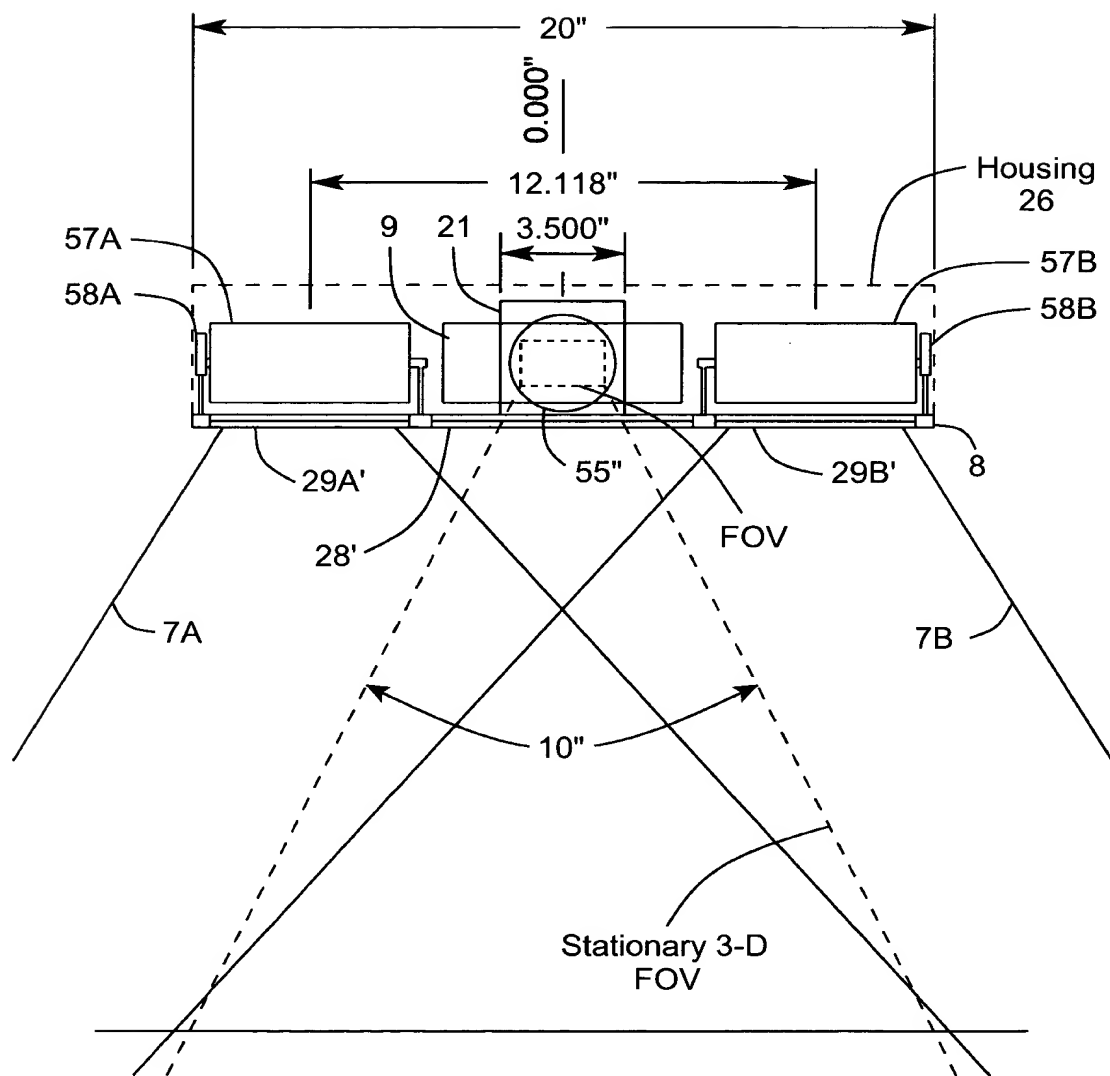


FIG. 6D3

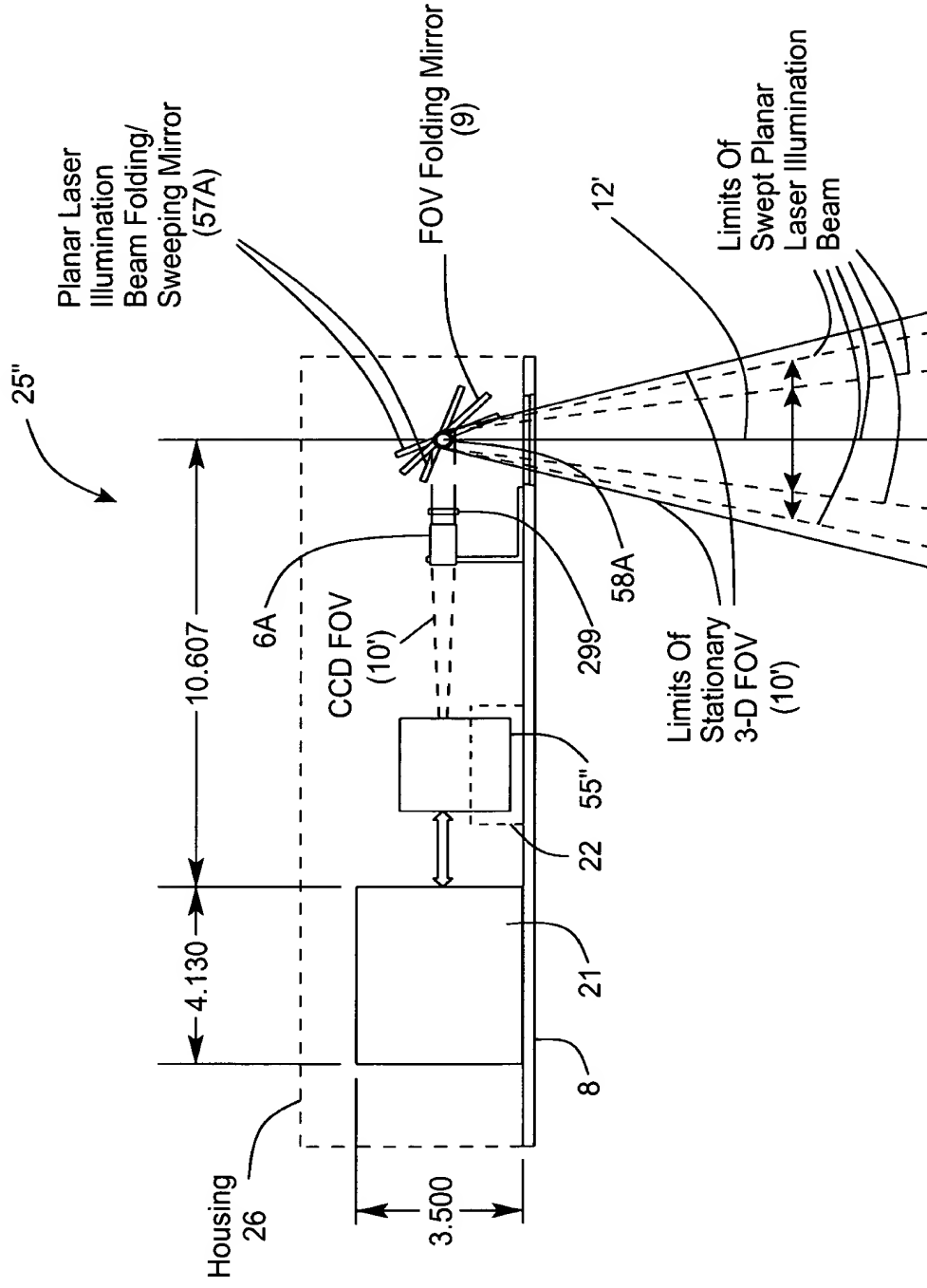


FIG. 6D4





\* Variable FOV

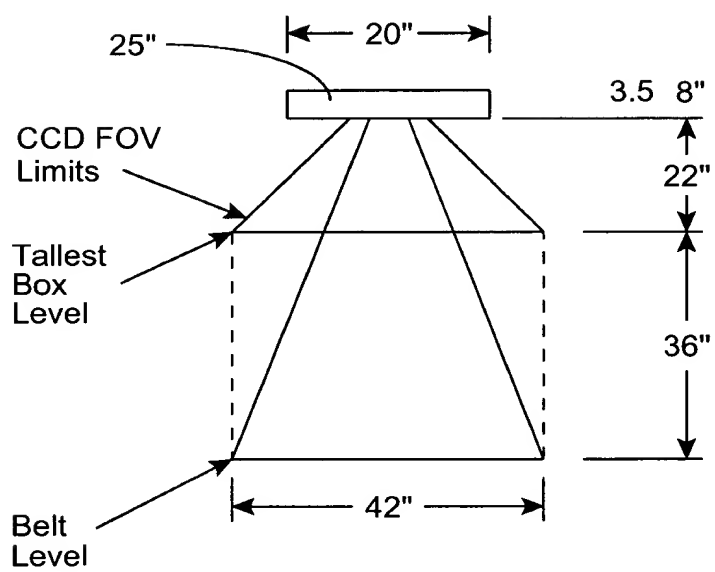


FIG. 6D5

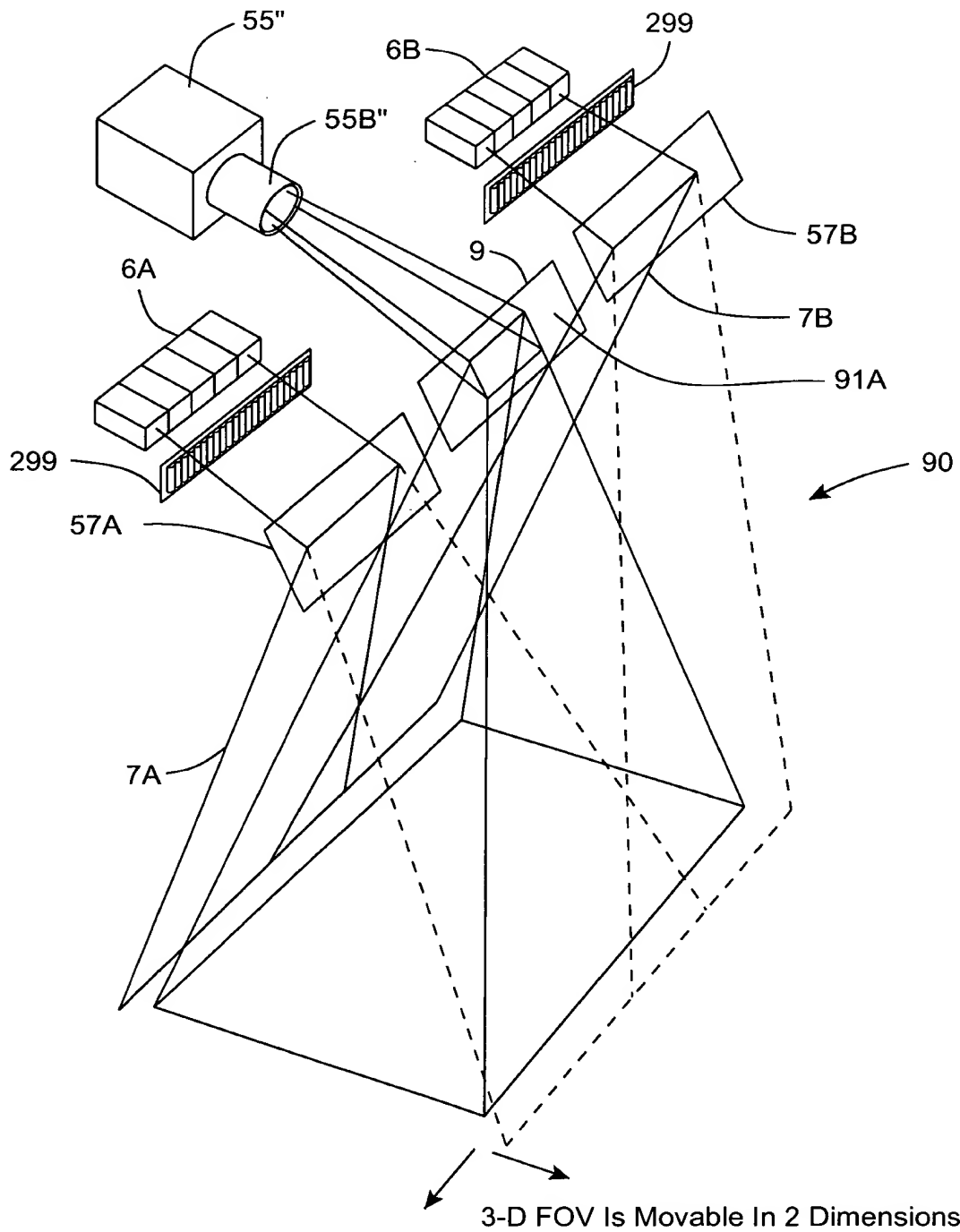


FIG. 6E1



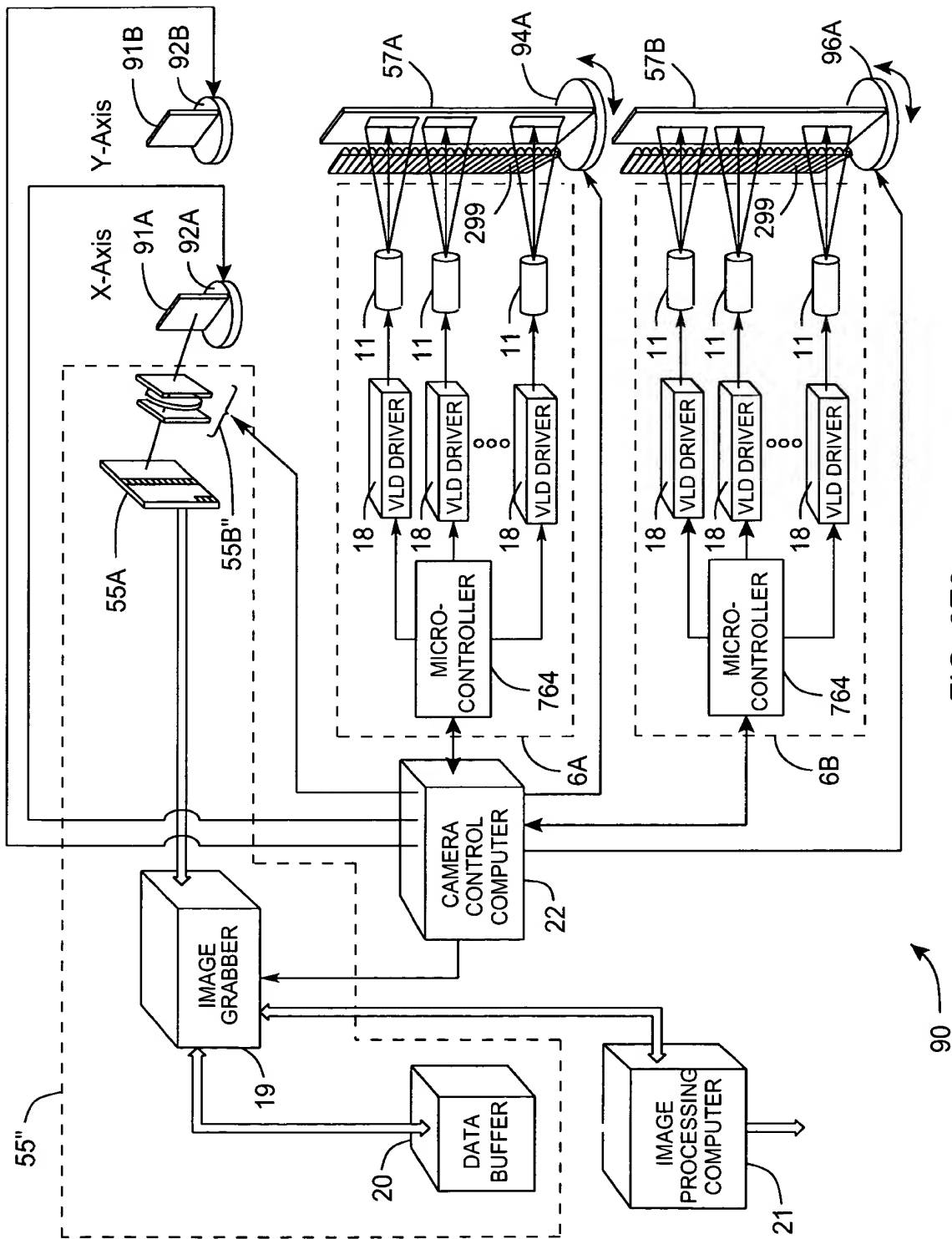


FIG. 6E3

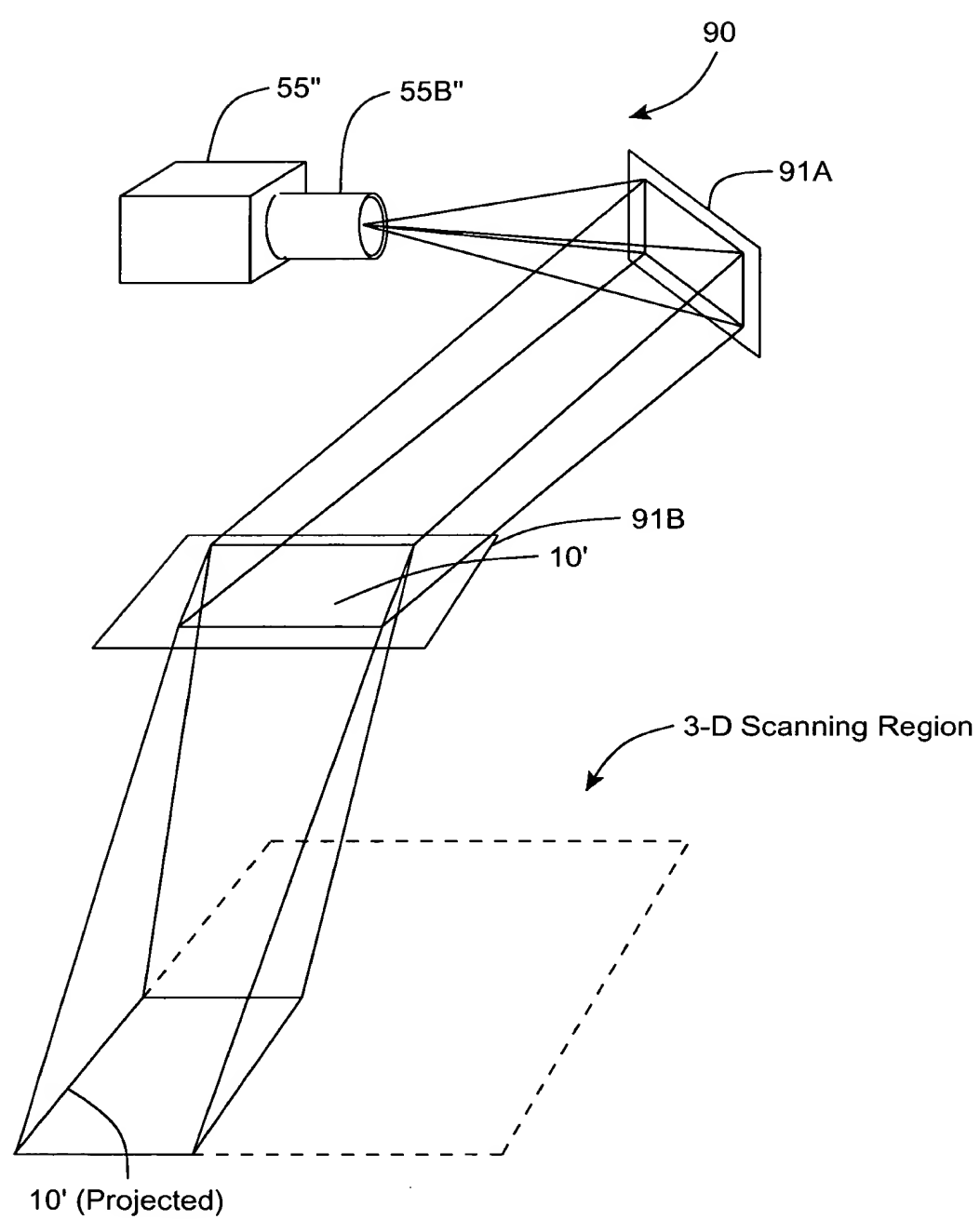


FIG. 6E4

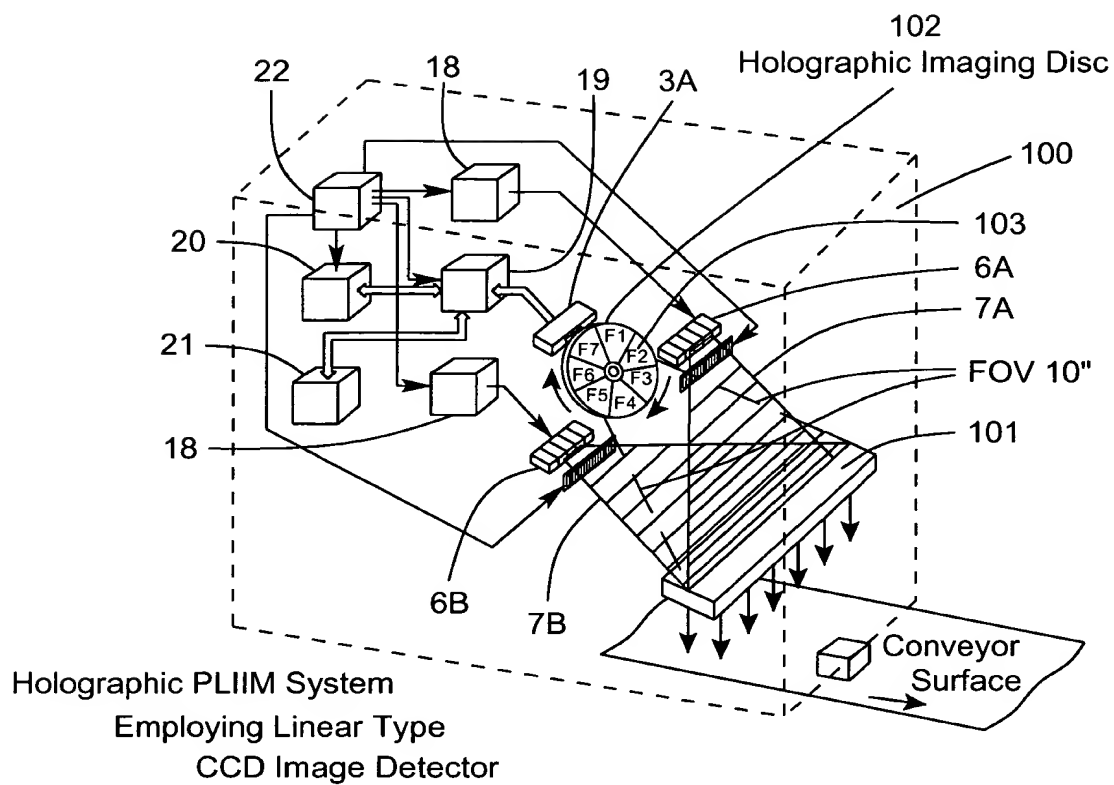


FIG. 7A

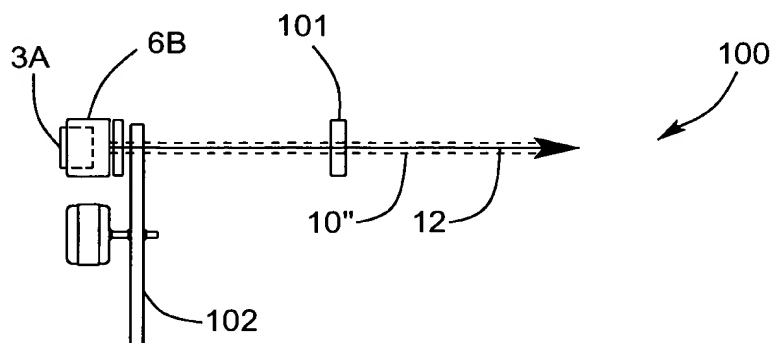


FIG. 7B

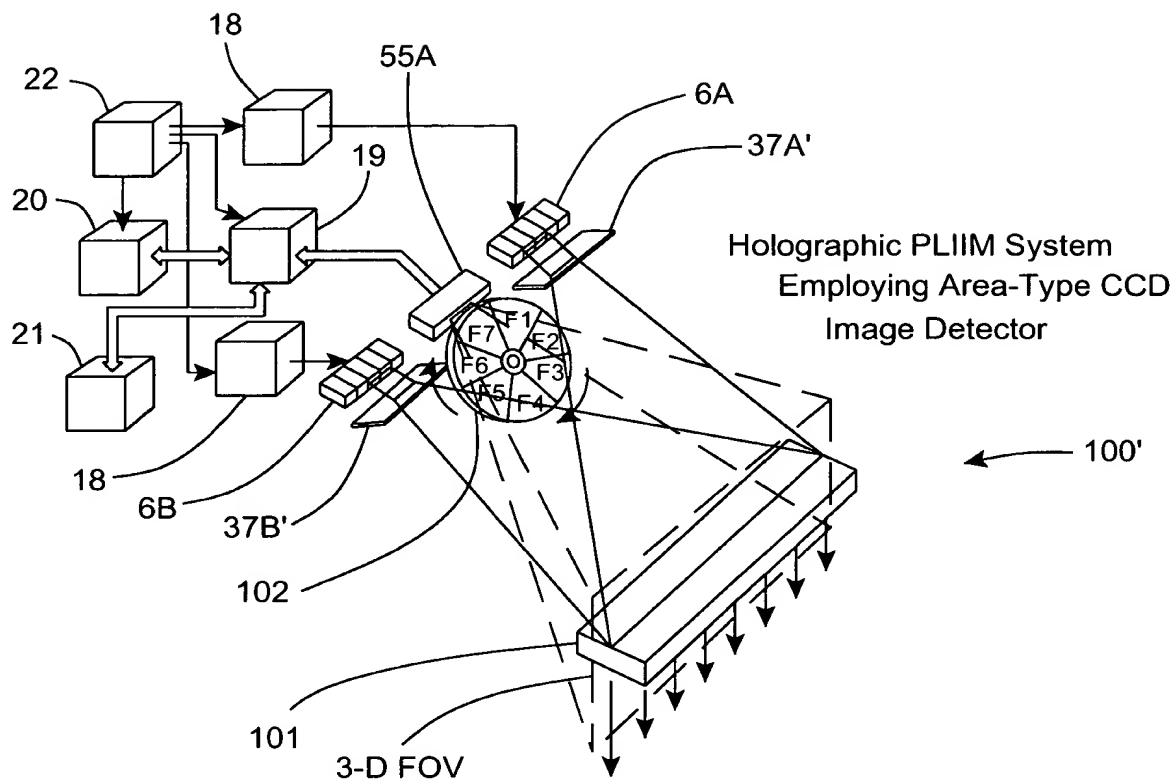


FIG. 8A

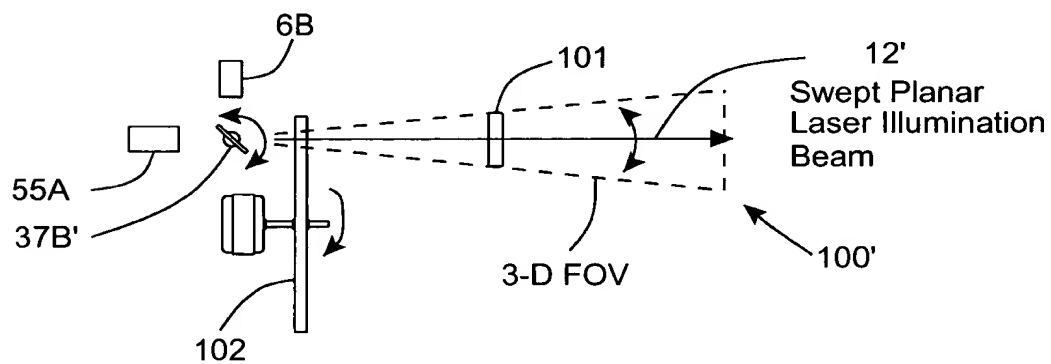


FIG. 8B

1-D Scanner Embodiment

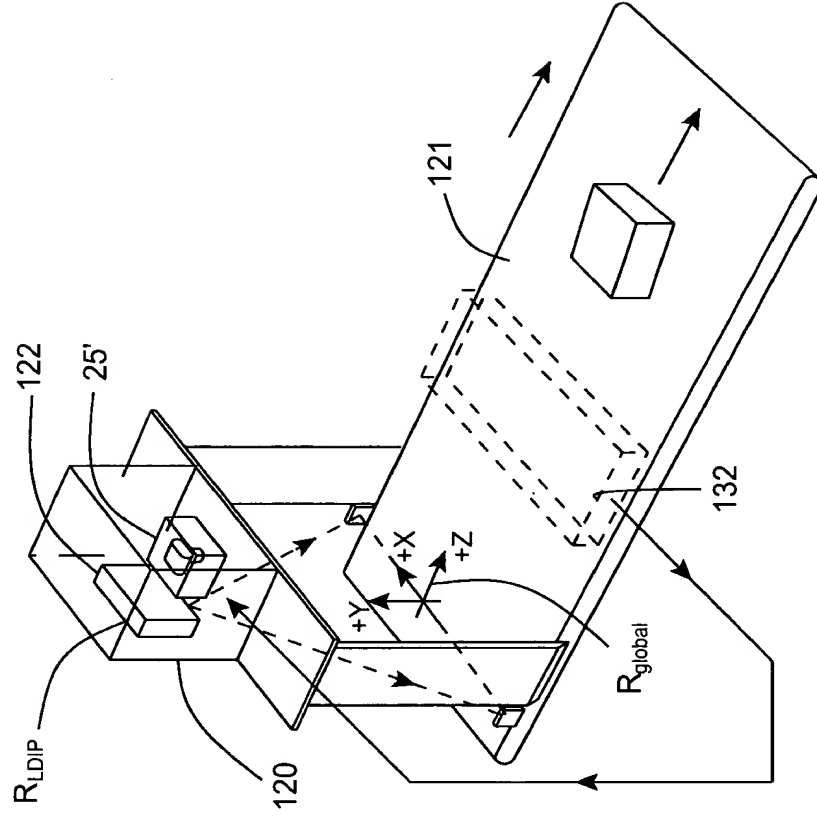


FIG. 9



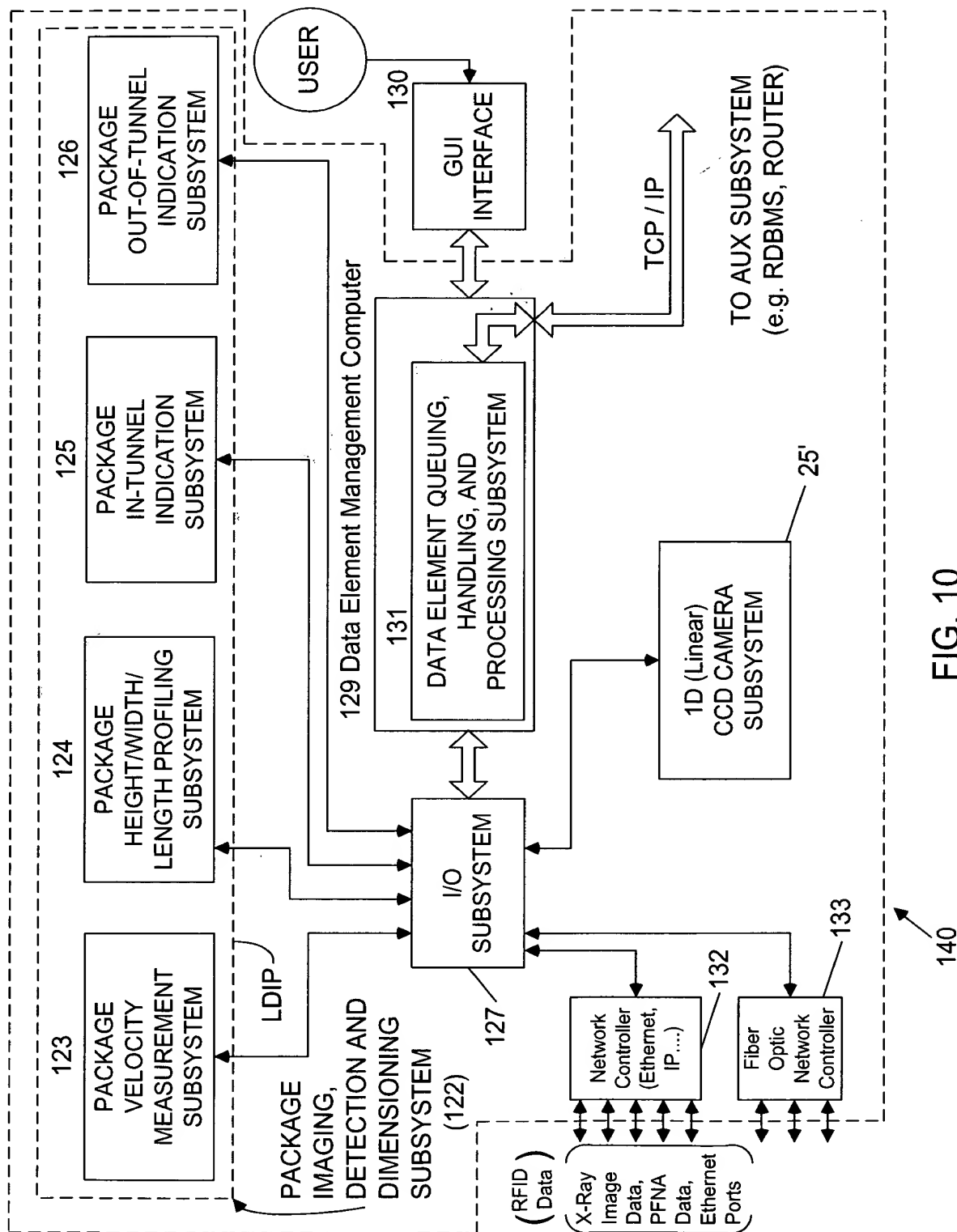


FIG. 10

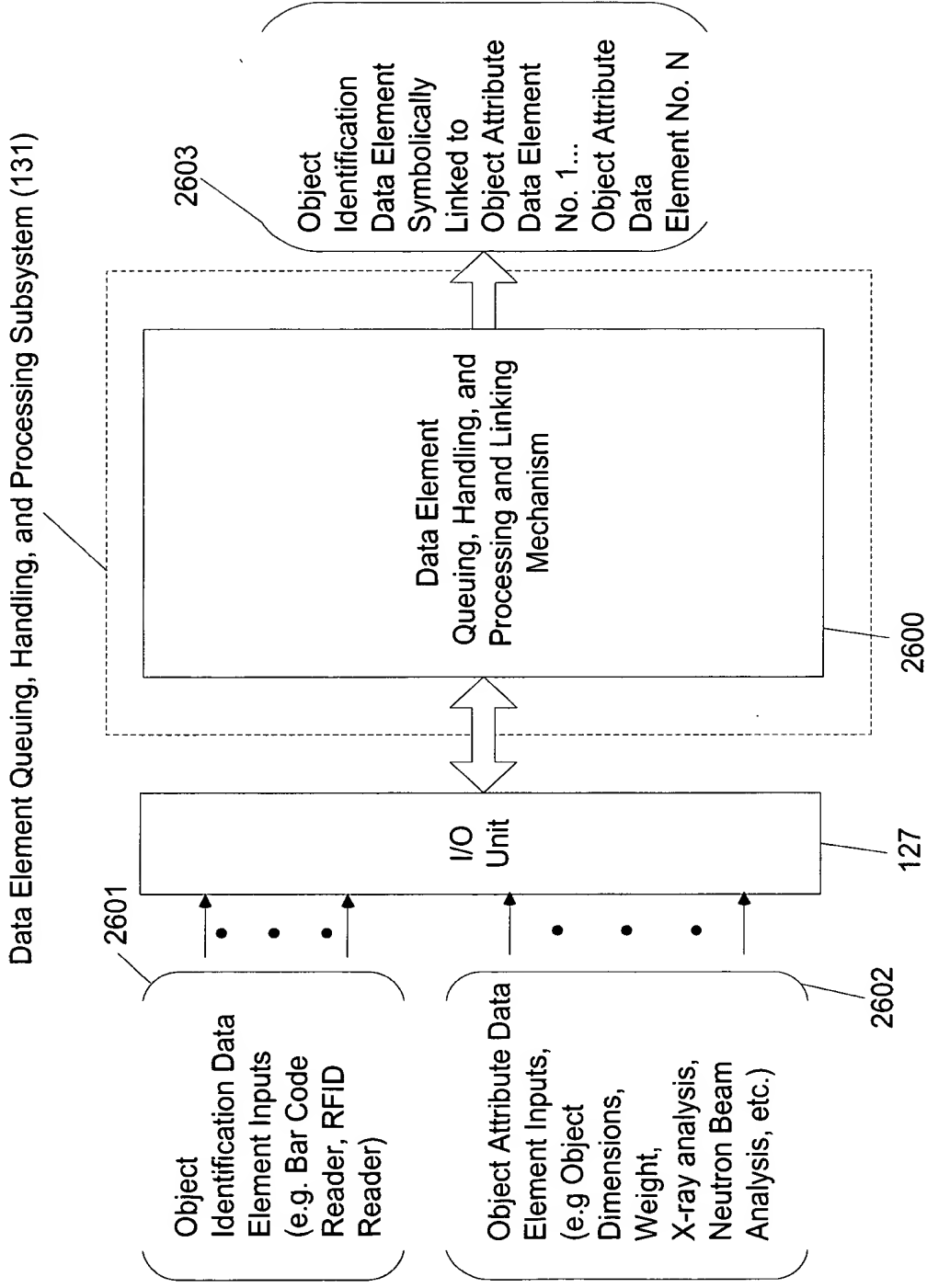


FIG. 10A



Specification of Object Detection, Tracking, and Identification and Attribute-Acquisition Capabilities of a Configured System or Network.

- Primary Network and/ or System Functions:
- A. Specification of Object Detection and Tracking Capability of System

B. Specification of Object Identification Capability of System

C. Specification of Object Attribute Acquisition Capability of System

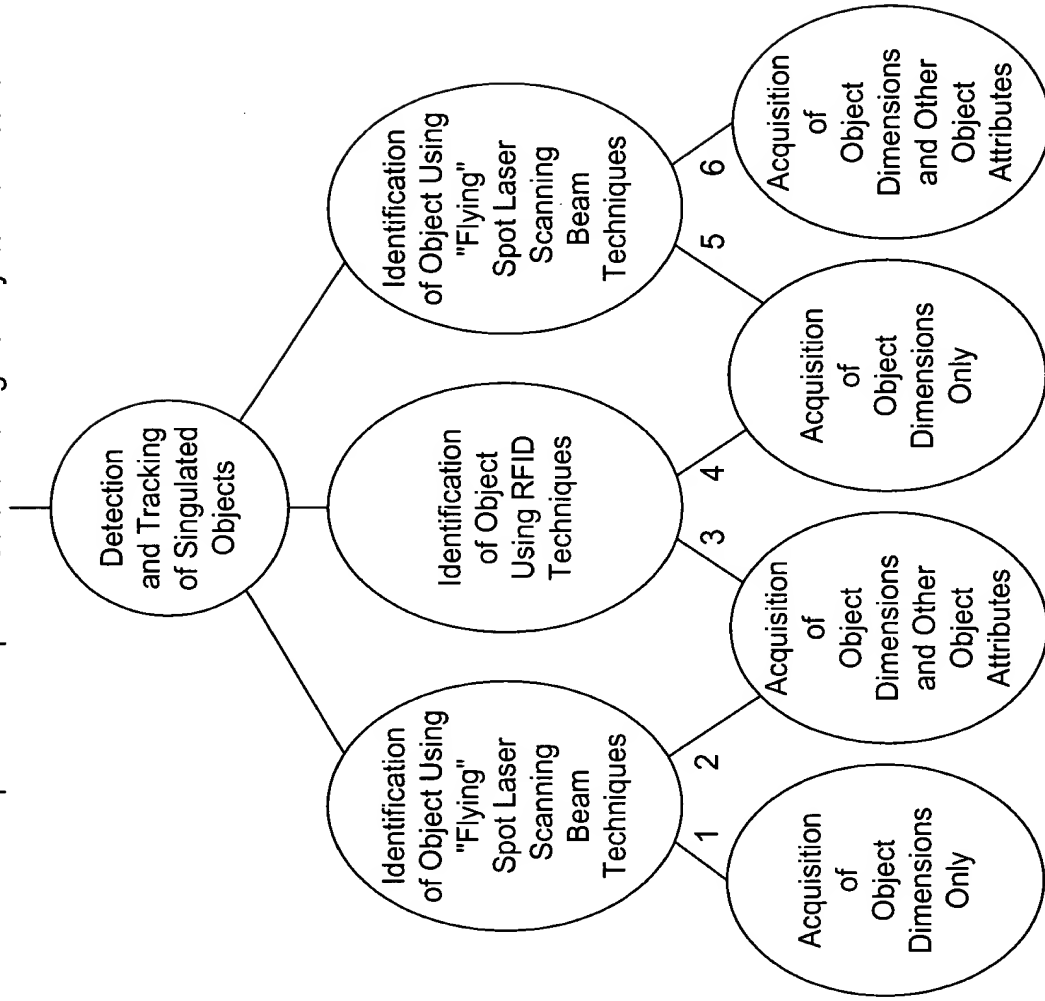


FIG. 10B-1

Primary Network and/ or System Functions:

A. Specification of Object Detection and Tracking Capability of System

B. Specification of Object Identification Capability of System

C. Specification of Object Attribute Acquisition Capability of System

Specification of Object Detection, Tracking, and Identification and Attribute-Acquisition Capabilities of a Configured System or Network.

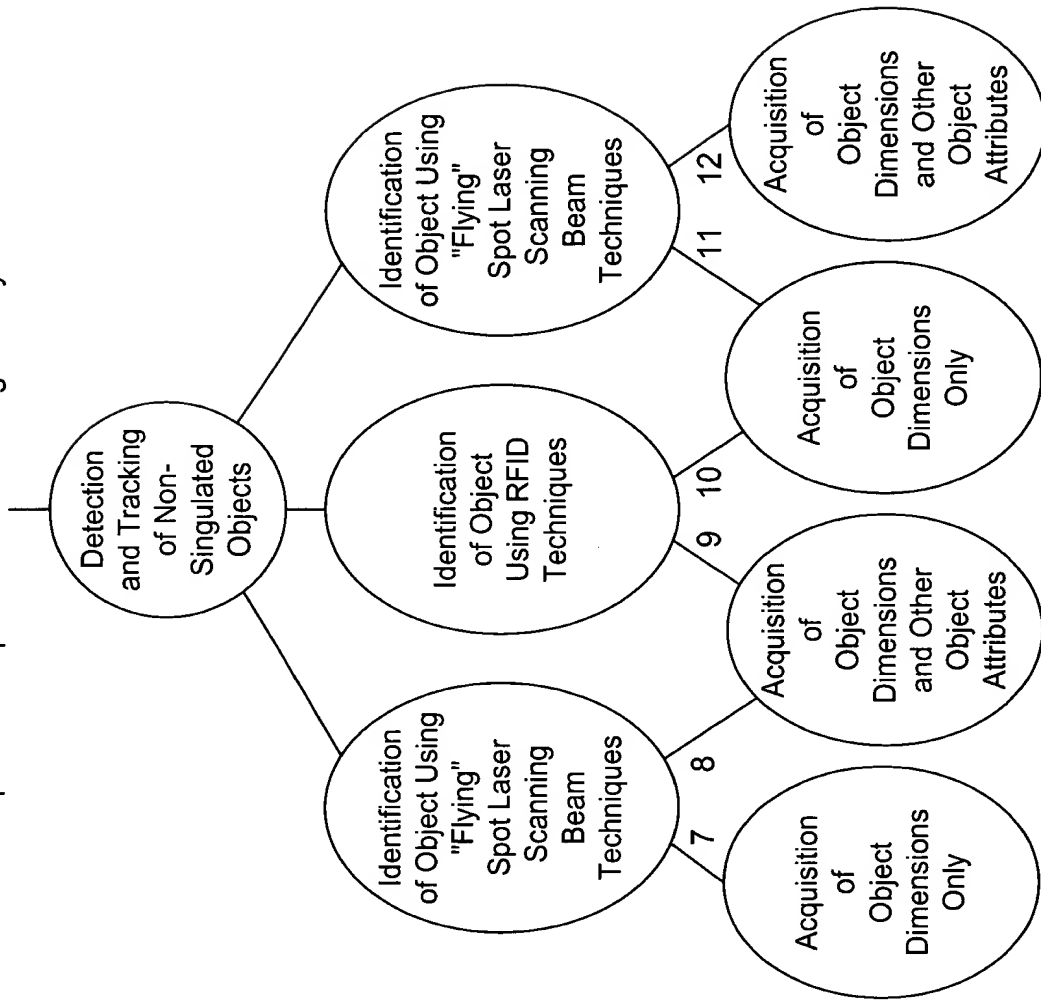


FIG. 10B-2

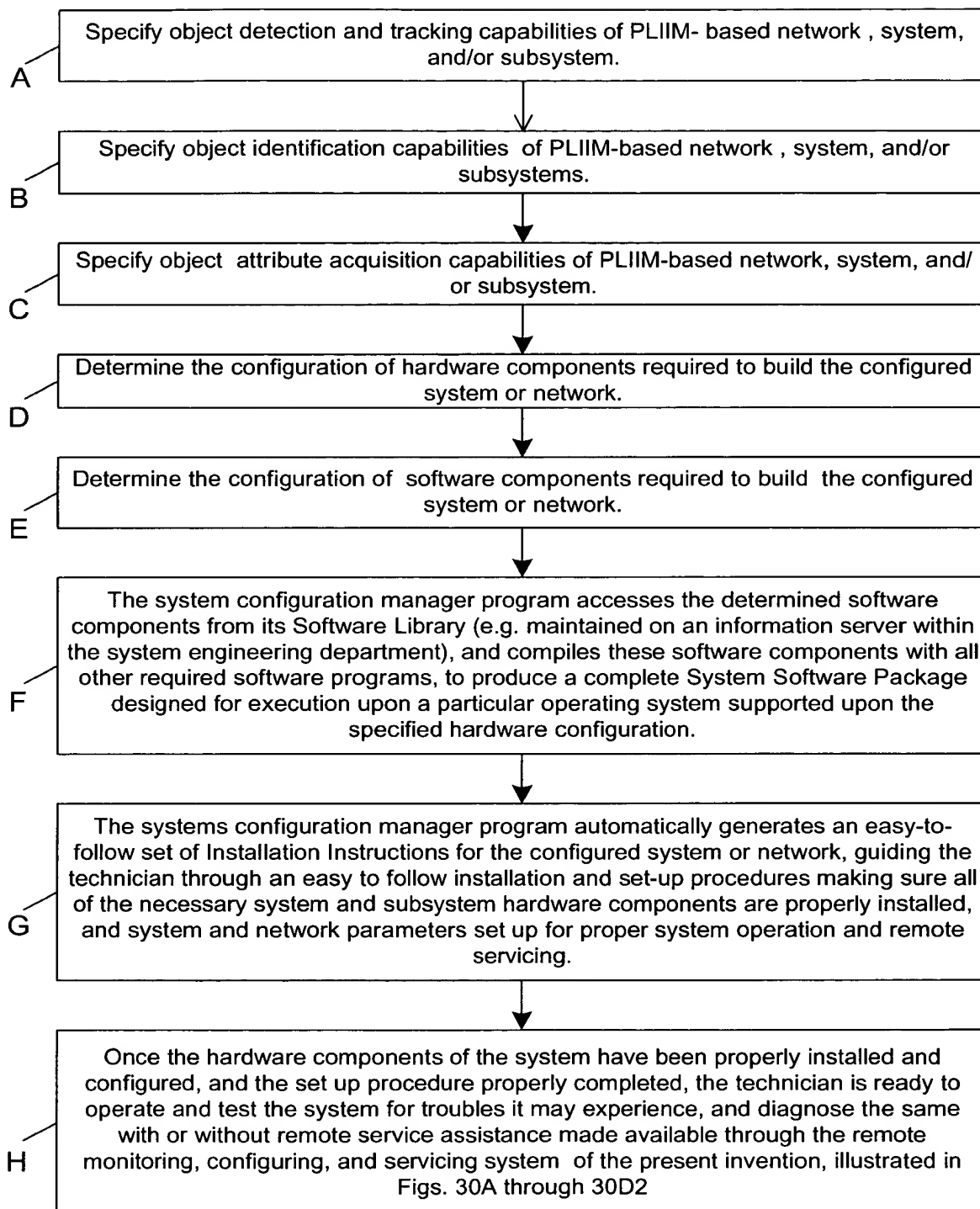


FIG. 10C

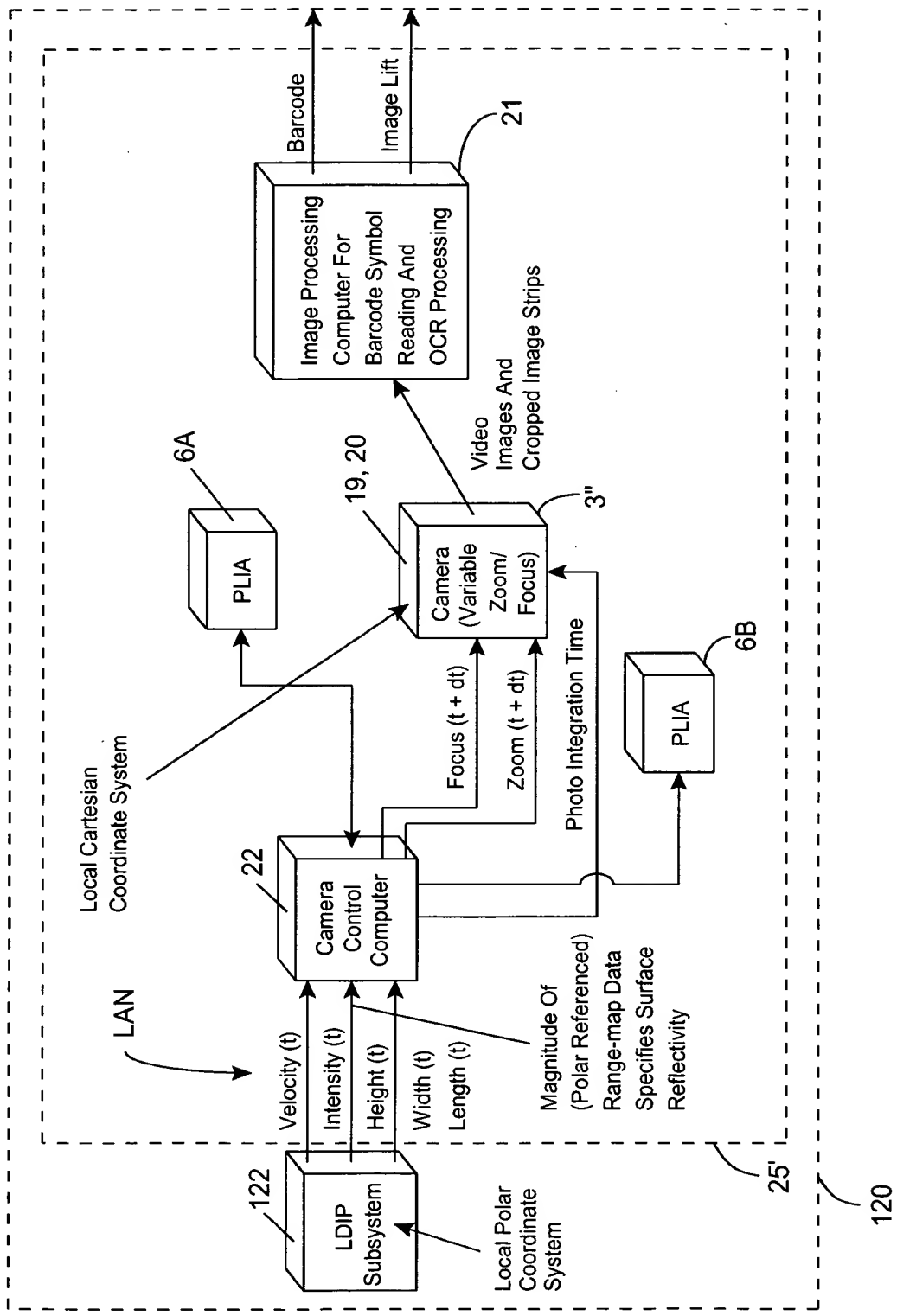


FIG. 11

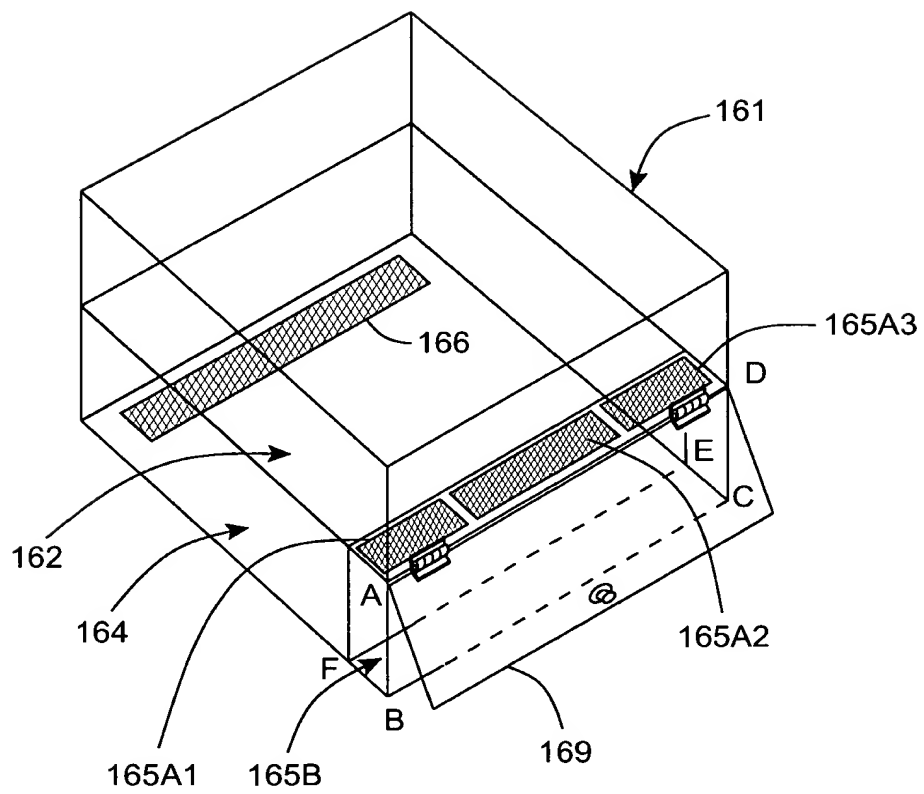


FIG. 12A

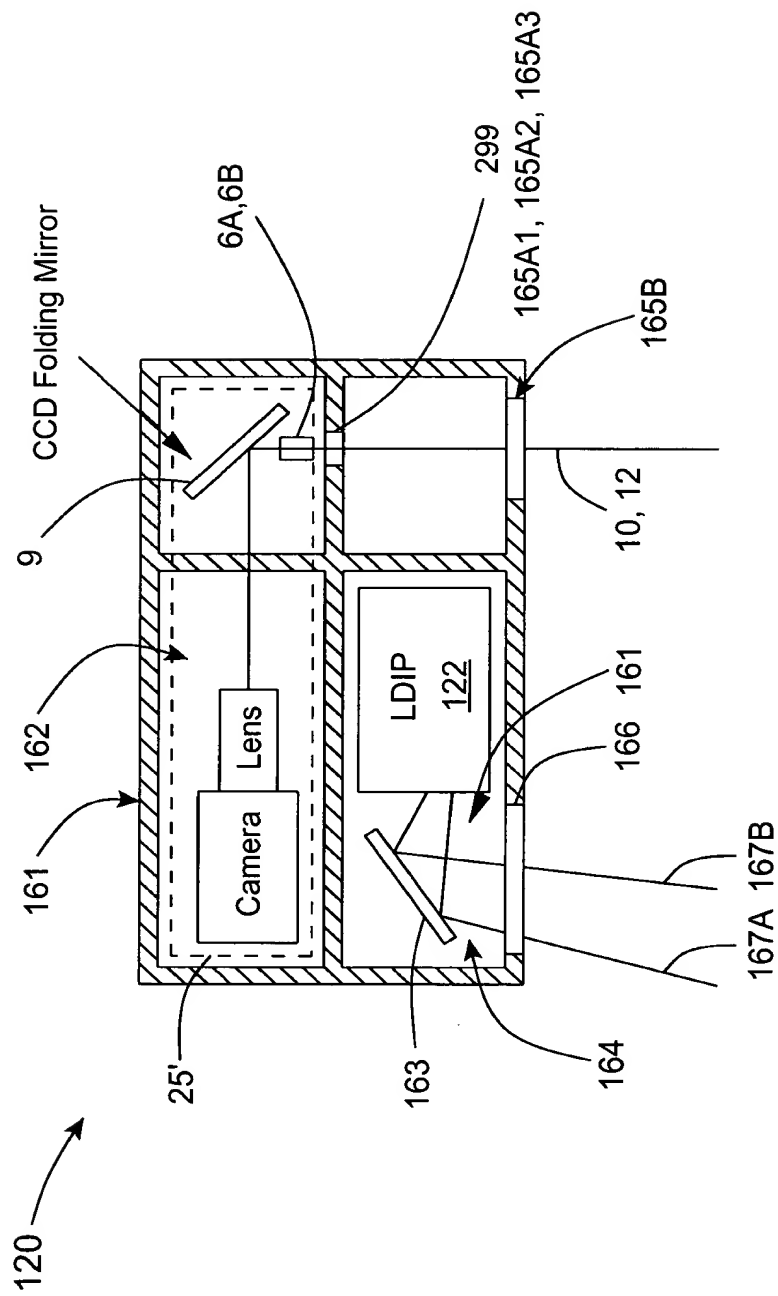


FIG. 12B



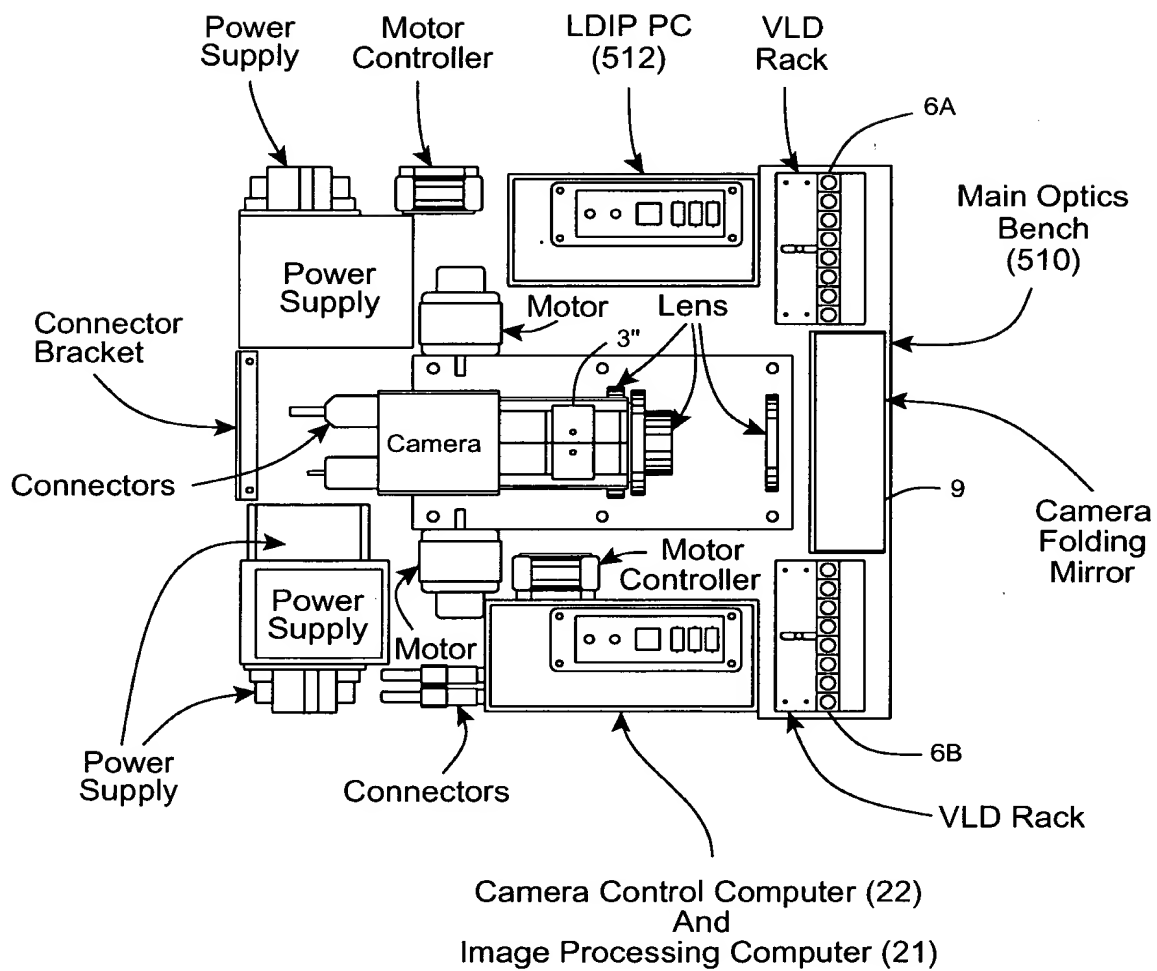


FIG. 12C

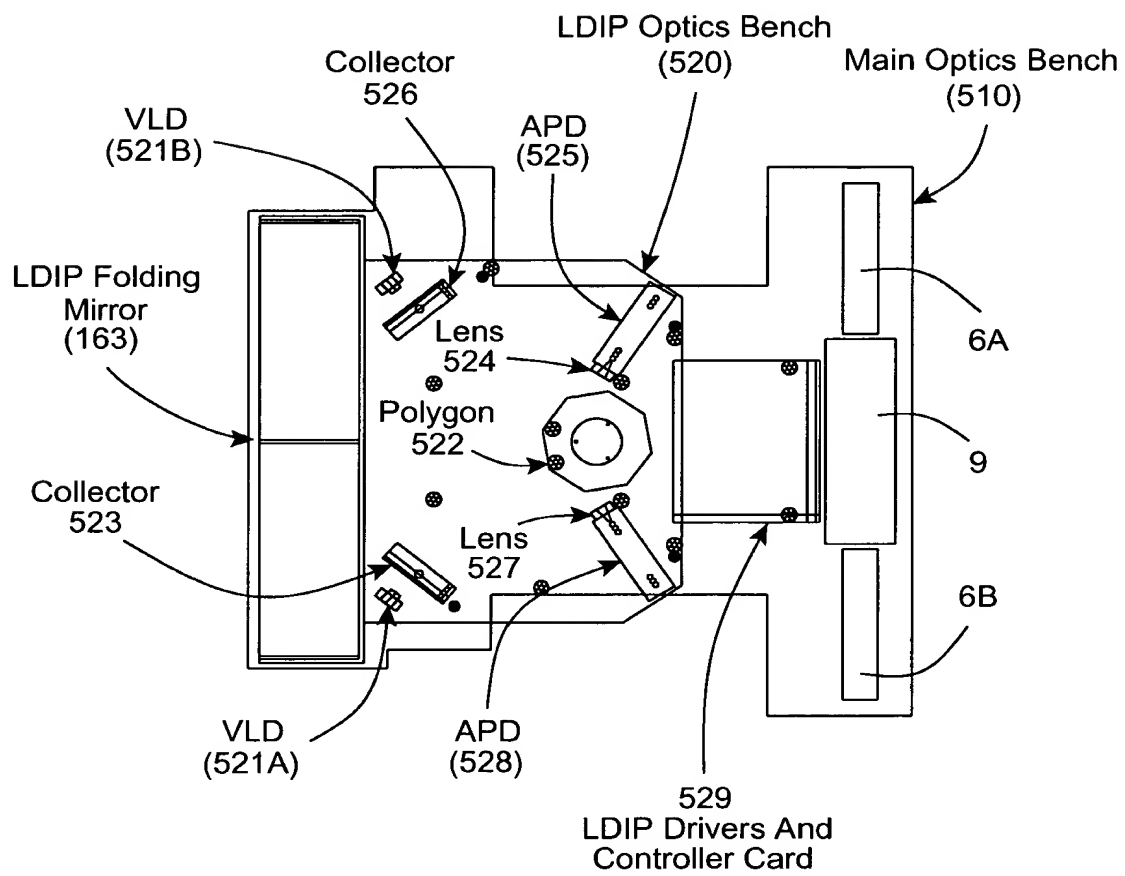
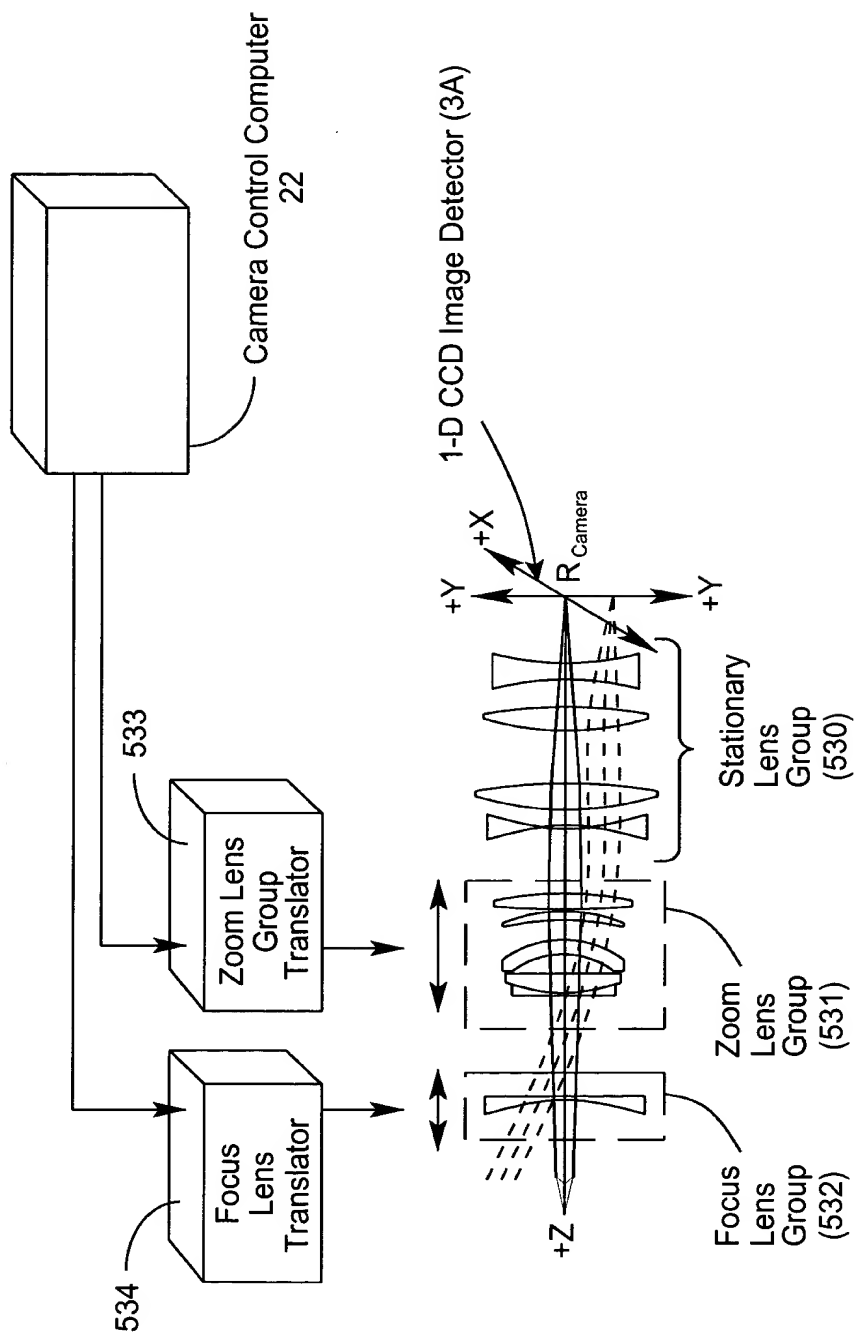


FIG. 12D



Main Optics Lens Groups

FIG. 12E

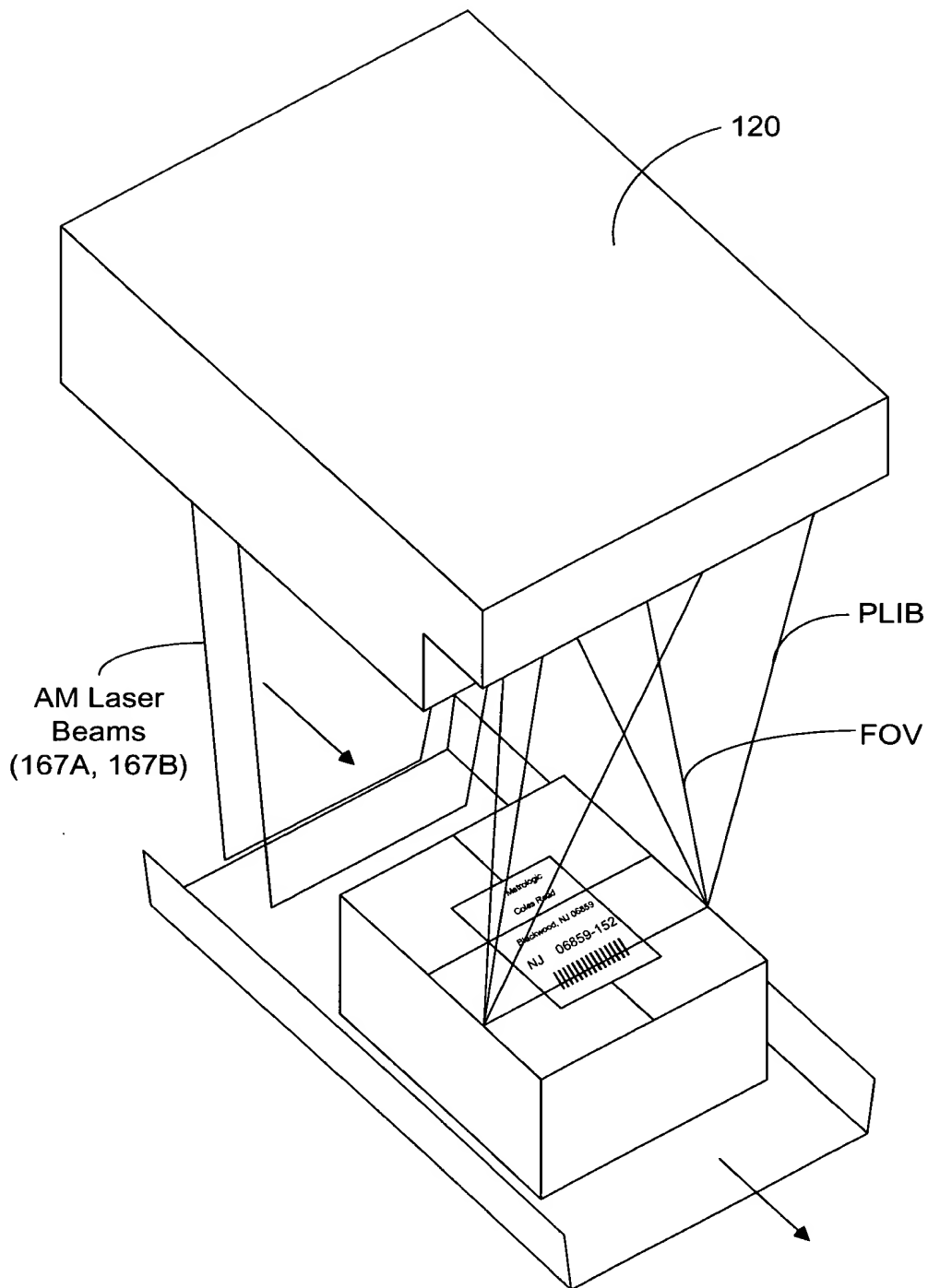
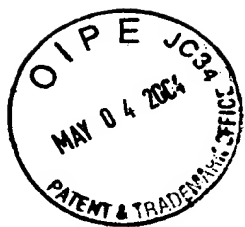


FIG. 13A

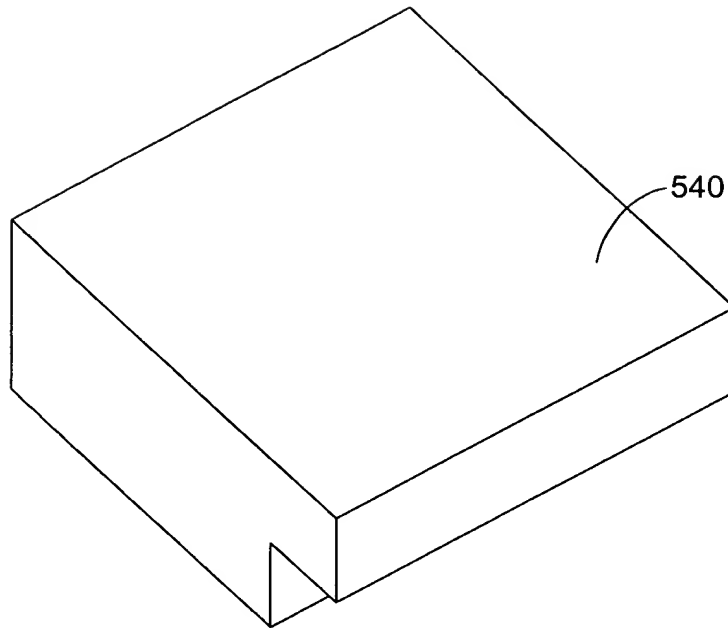


FIG. 13B

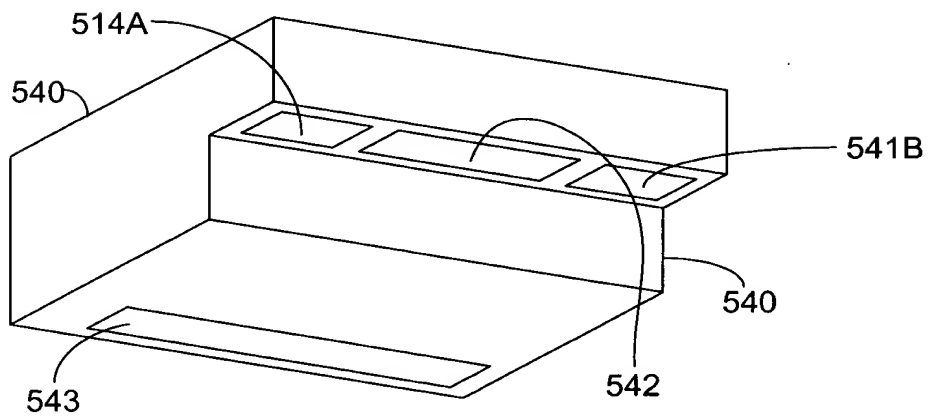


FIG. 13C



PLIIM-BASED PACKAGE IDENTIFICATION AND  
DIMENSIONING (PID) SYSTEM

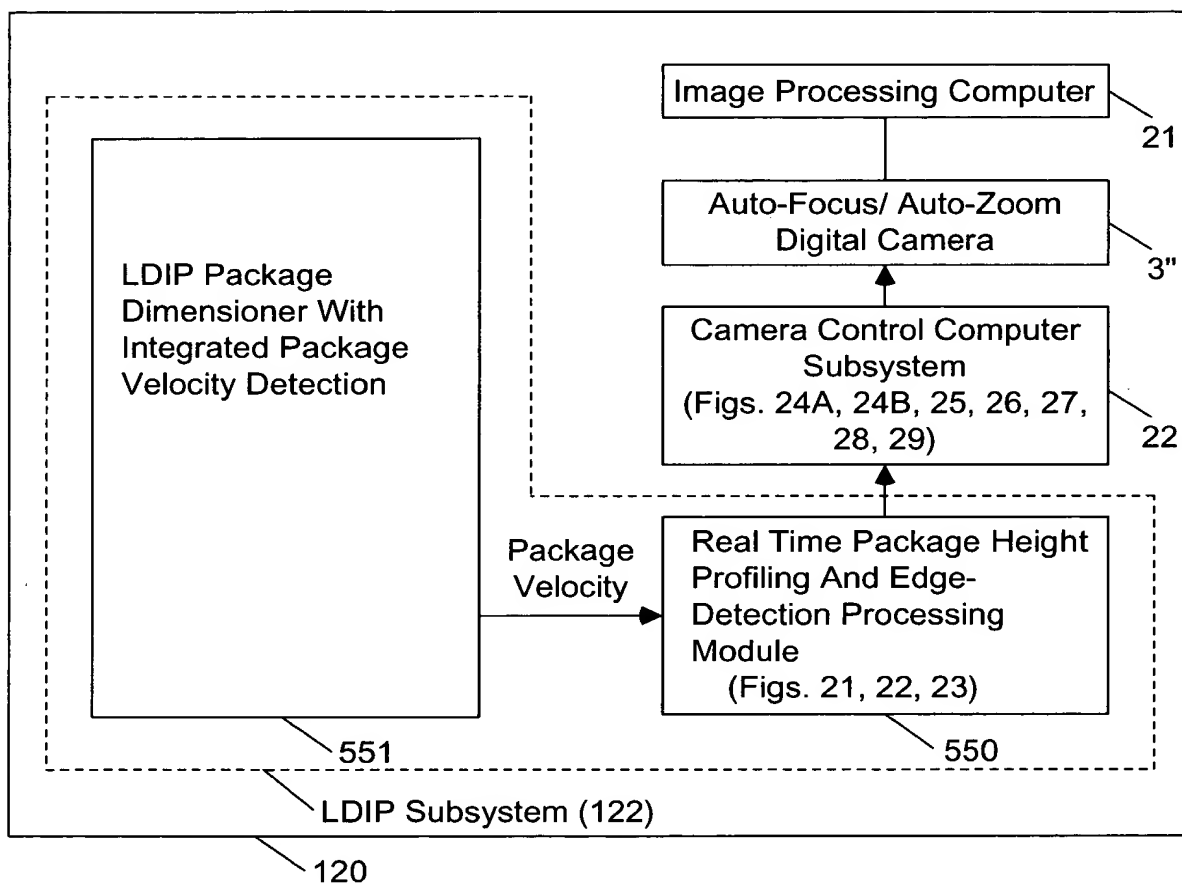


FIG. 14



## LDIP REAL-TIME PACKAGE HEIGHT PROFILE AND EDGE DETECTION METHOD

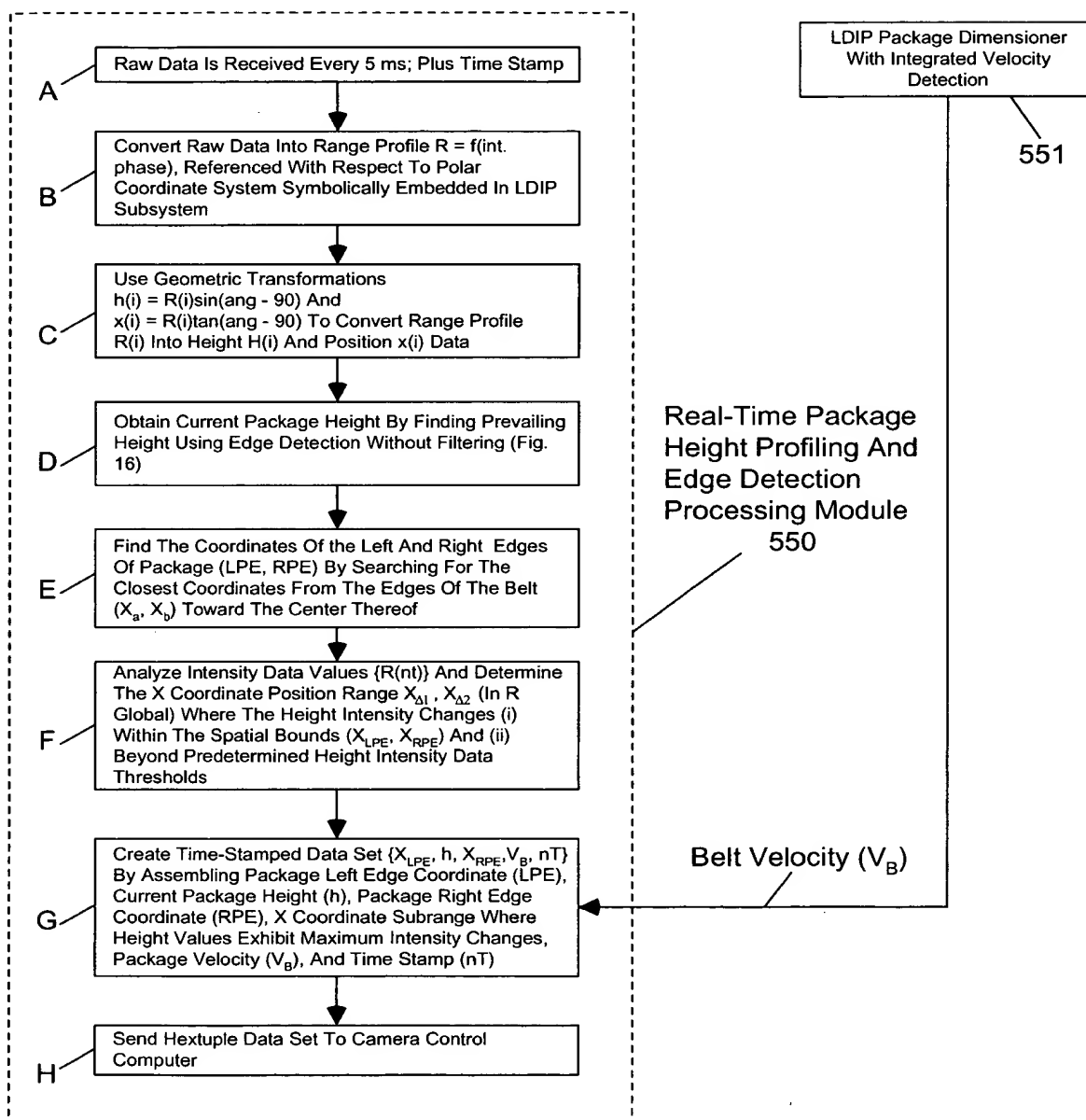
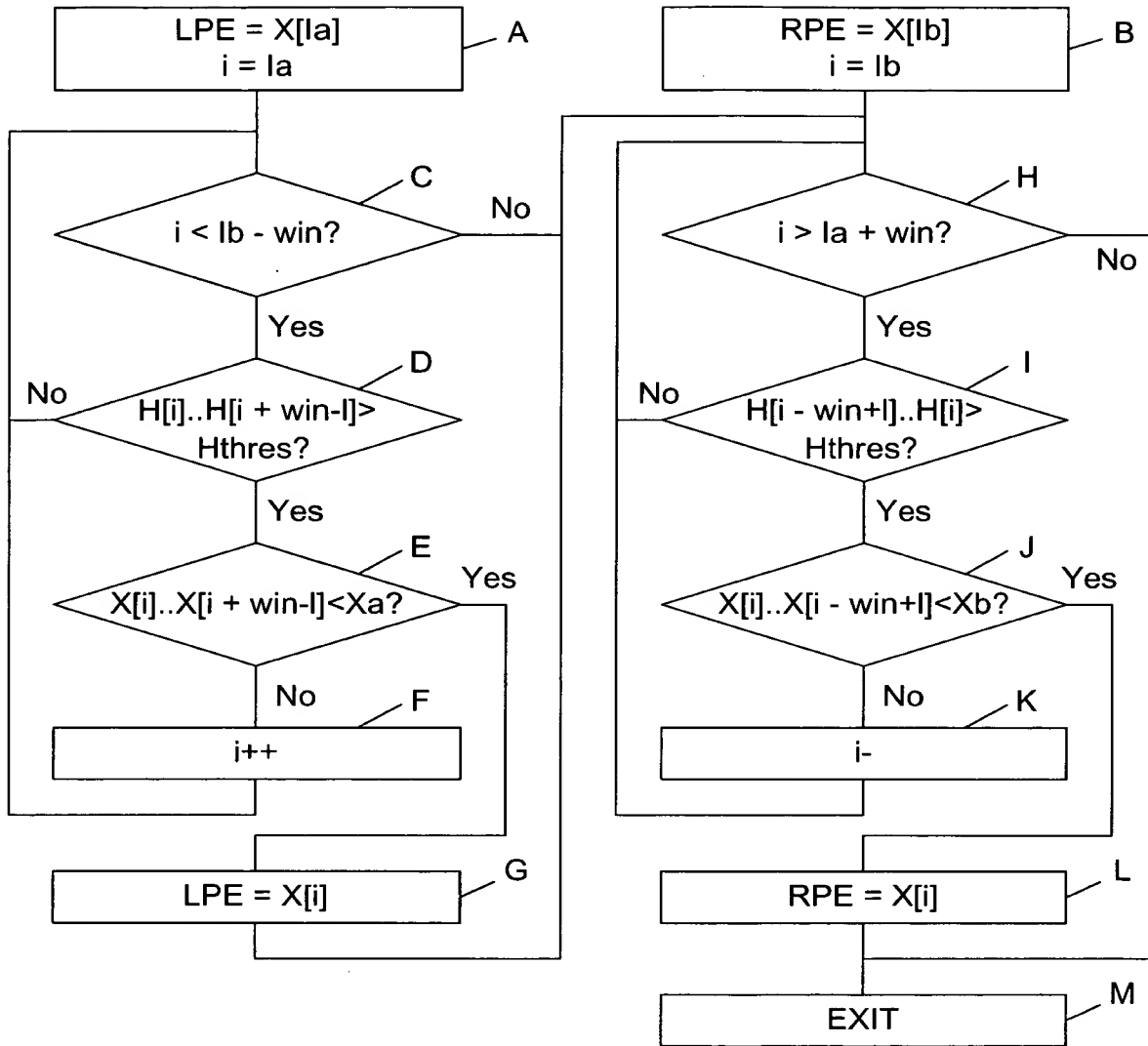


FIG. 15

# LDIP REAL-TIME PACKAGE EDGE DETECTION



Xa = Location Of Belt Left Edge; Xb = Location Of Belt Right Edge  
la = Belt Left Edge Pixel; lb = Belt Right Edge Pixel  
LPE = Left package Edge; RPE = Right Package Edge  
H[] = Pixel Height Array; X[] = Pixel Location Array  
win = Package detection Window

FIG. 16



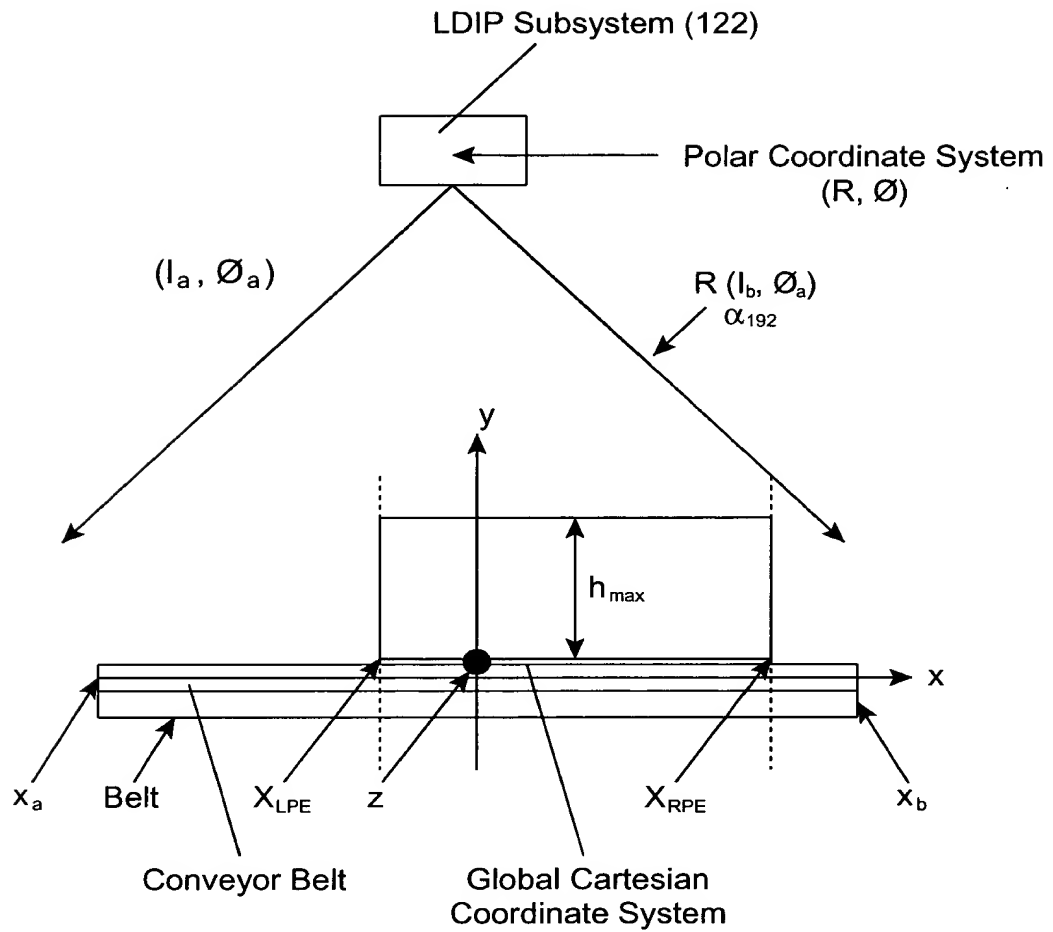


FIG. 17



### Information Measured At Scan Angles Before Coordinate Transformations

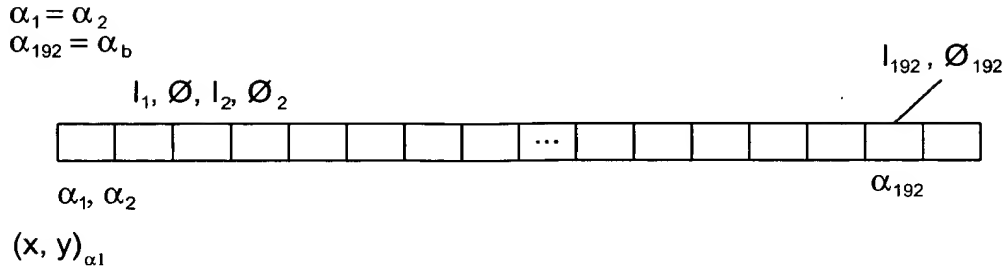


FIG. 17A

### Range And Polar Angle Measures Taken At Scan Angle $\alpha$ Before Coordinate Transforms

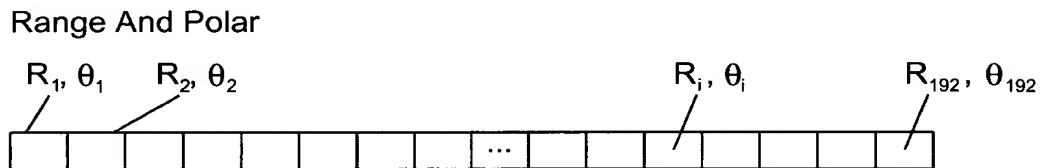


FIG. 17B

### Measured Package Height And Position Values After Coordinate Transforms

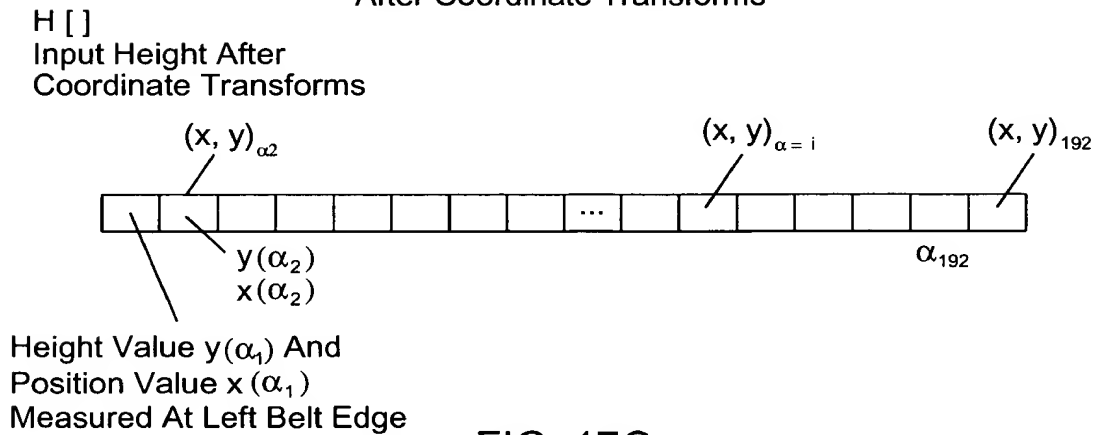


FIG. 17C



CAMERA CONTROL PROCESS CARRIED OUT WITHIN THE CAMERA  
CONTROL SUBSYSTEM OF EACH OBJECT IDENTIFICATION AND  
ATTRIBUTE ACQUISITION SYSTEM OF PRESENT INVENTION

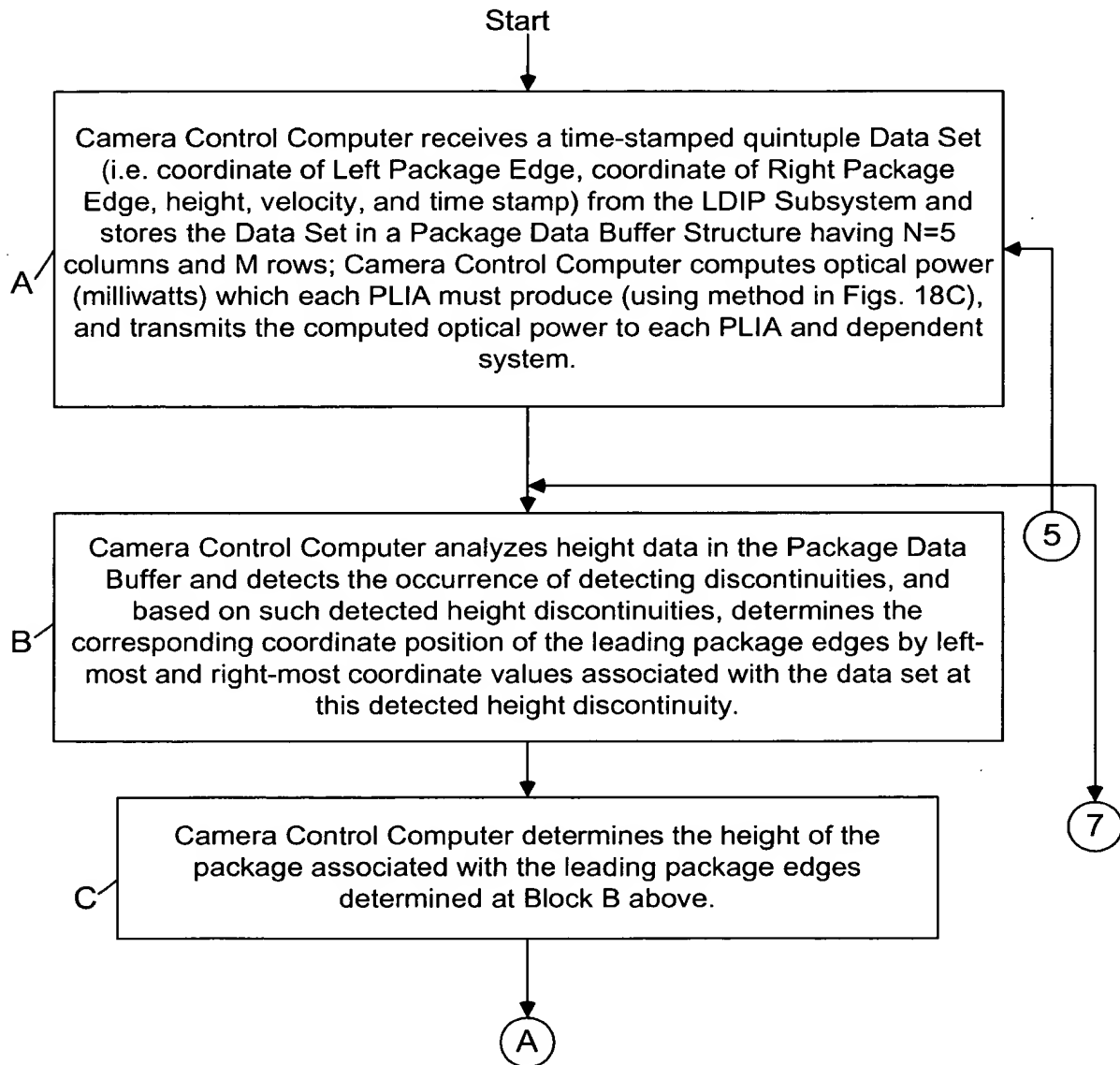


FIG. 18A-1

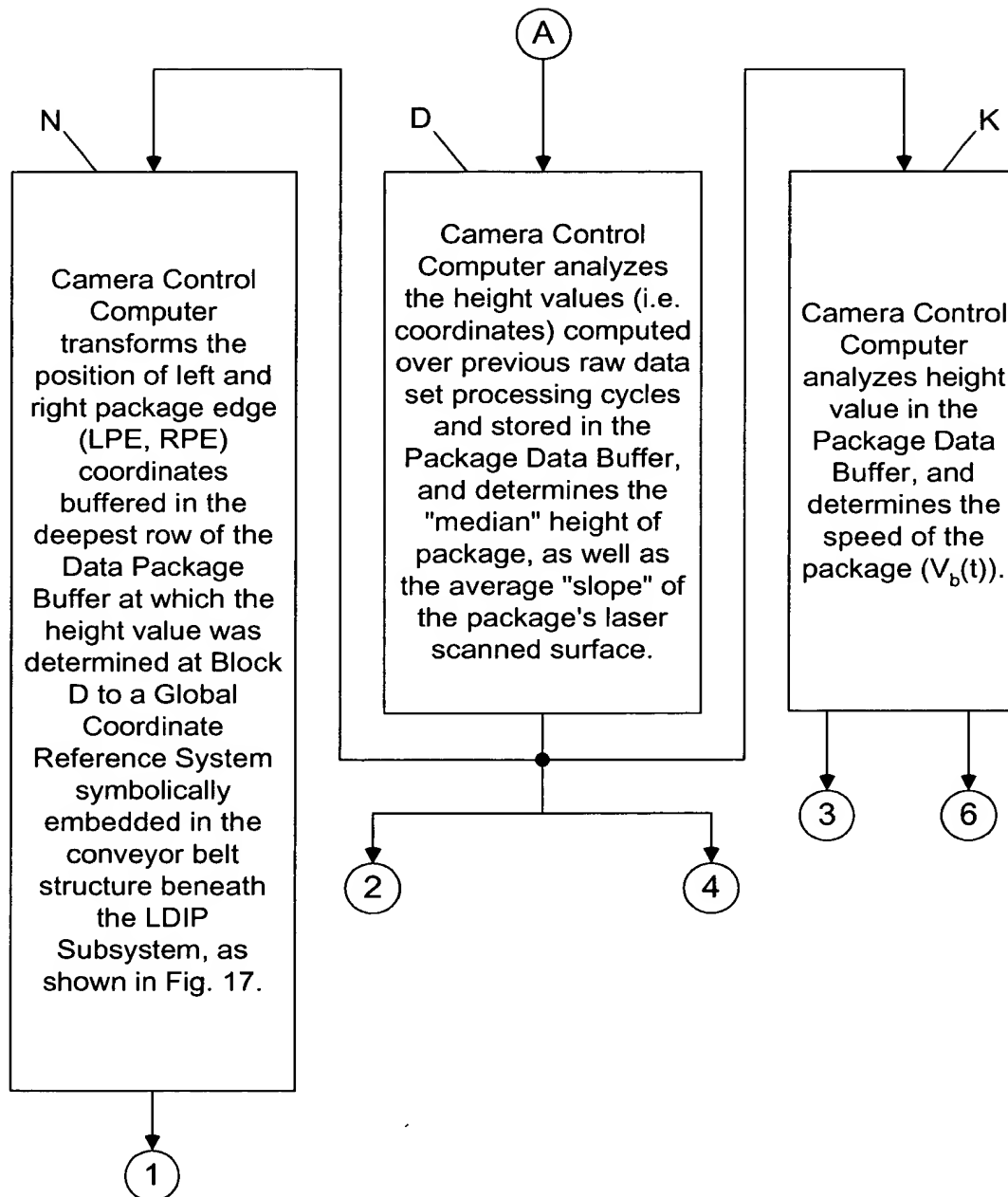


FIG. 18A-2

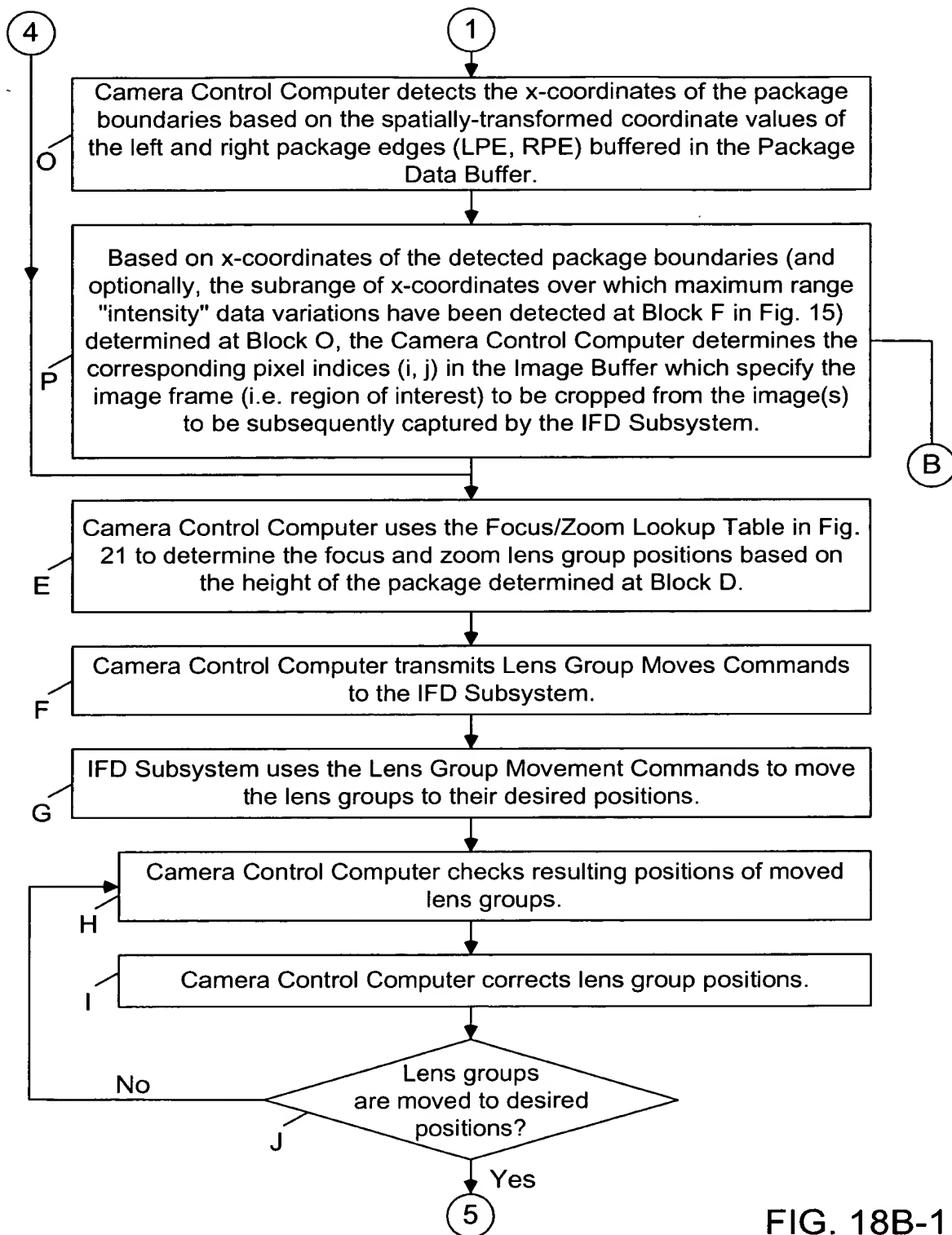


FIG. 18B-1

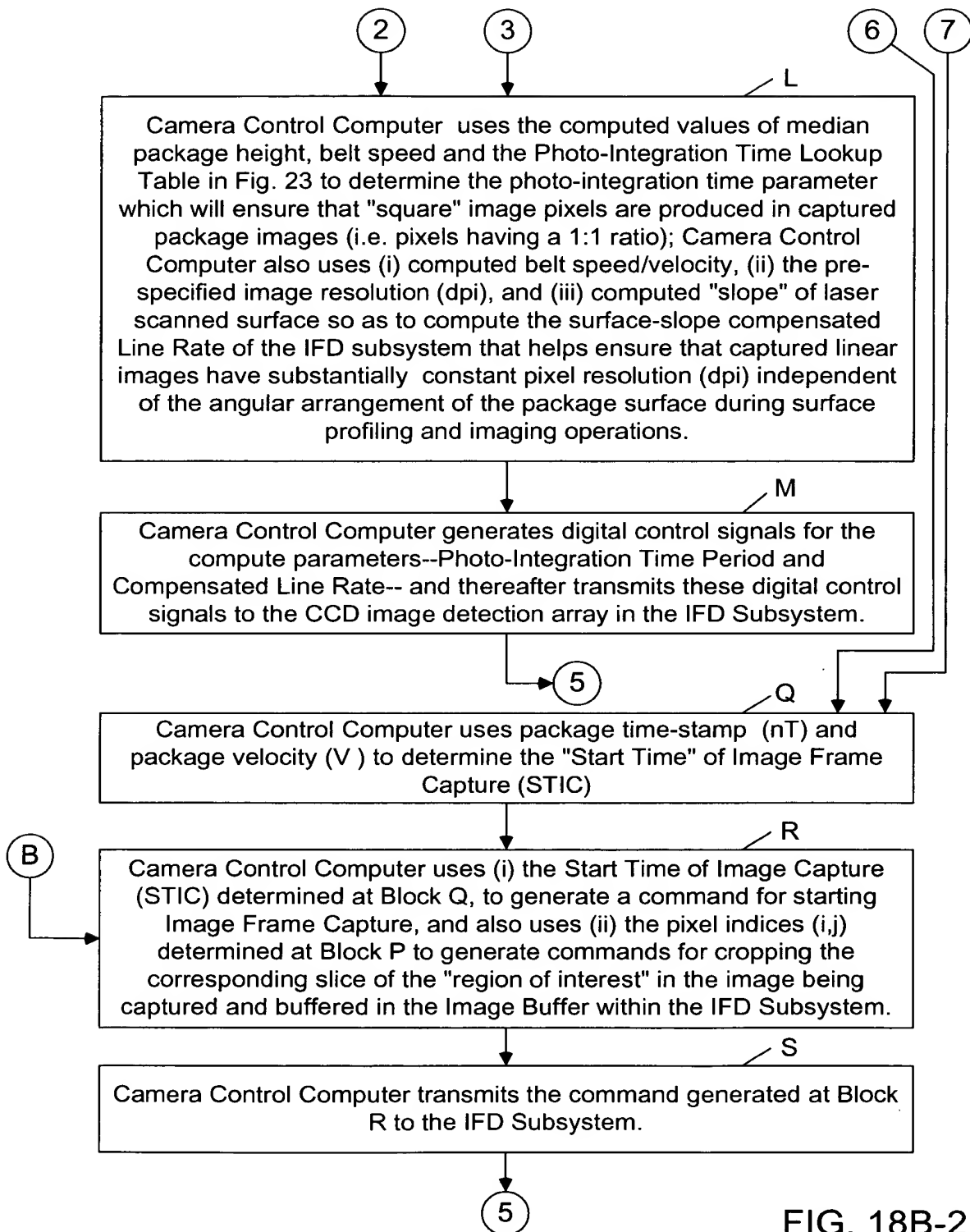


FIG. 18B-2



METHOD OF COMPUTING OPTICAL OUTPUT POWER FROM LASER  
DIODES IN A PLANAR LASER ILLUMINATION ARRAY (PLIA) FOR  
CONTROLLING THE CONSTANT WHITE-LEVEL IN IMAGE PIXELS  
CAPTURED BY A PLIIM-BASED LINEAR IMAGER

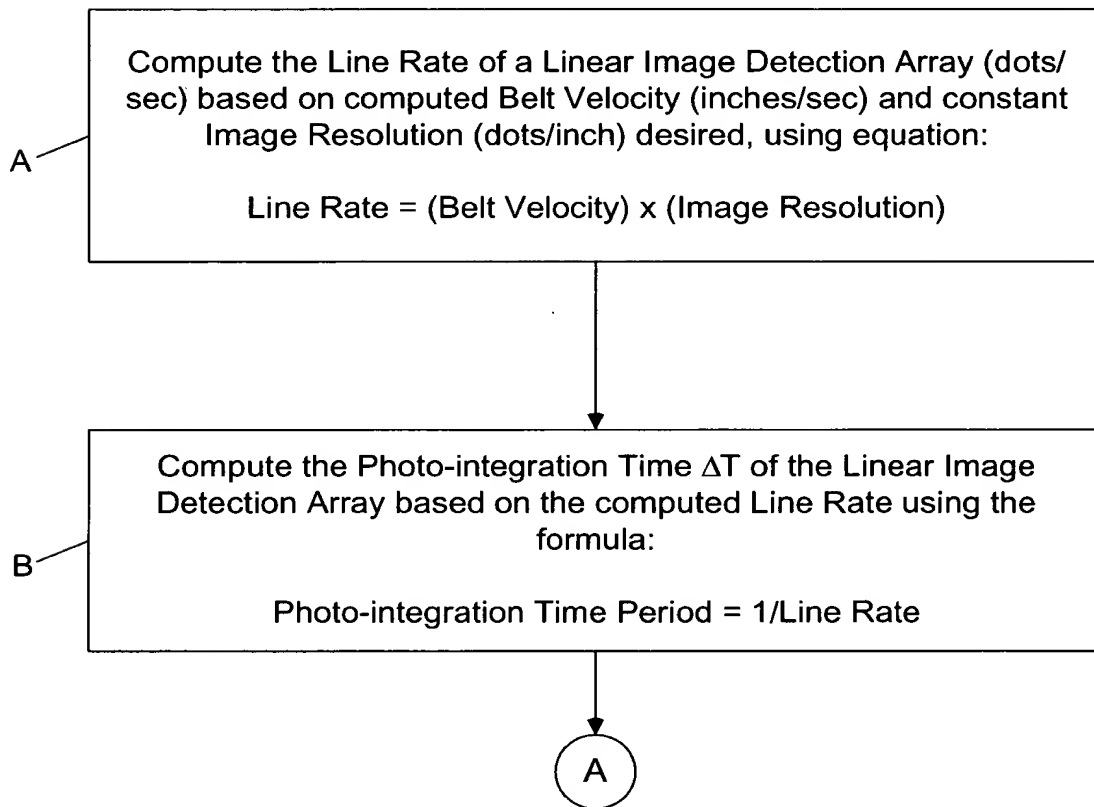


FIG. 18C1



Compute the Optical Power (milliwatts) of each PLIA based on the computed Photo-integration Time Period ( $\Delta T$ ) using the following formula:

$$\text{Optical Power of VLD (milliwatts)} = \frac{\text{constant}}{\text{Photo-integration Time Period } \Delta T}$$

FIG. 18C2





METHOD OF COMPUTING COMPENSATED LINE RATE FOR CORRECTING  
VIEWING-ANGLE DISTORTION OCCURING IN IMAGES OF OBJECT  
SURFACES CAPTURED AS OBJECT SURFACES MOVE PAST A PLIIM-  
BASED LINEAR IMAGER AT NON-ZERO SKEWED ANGLE

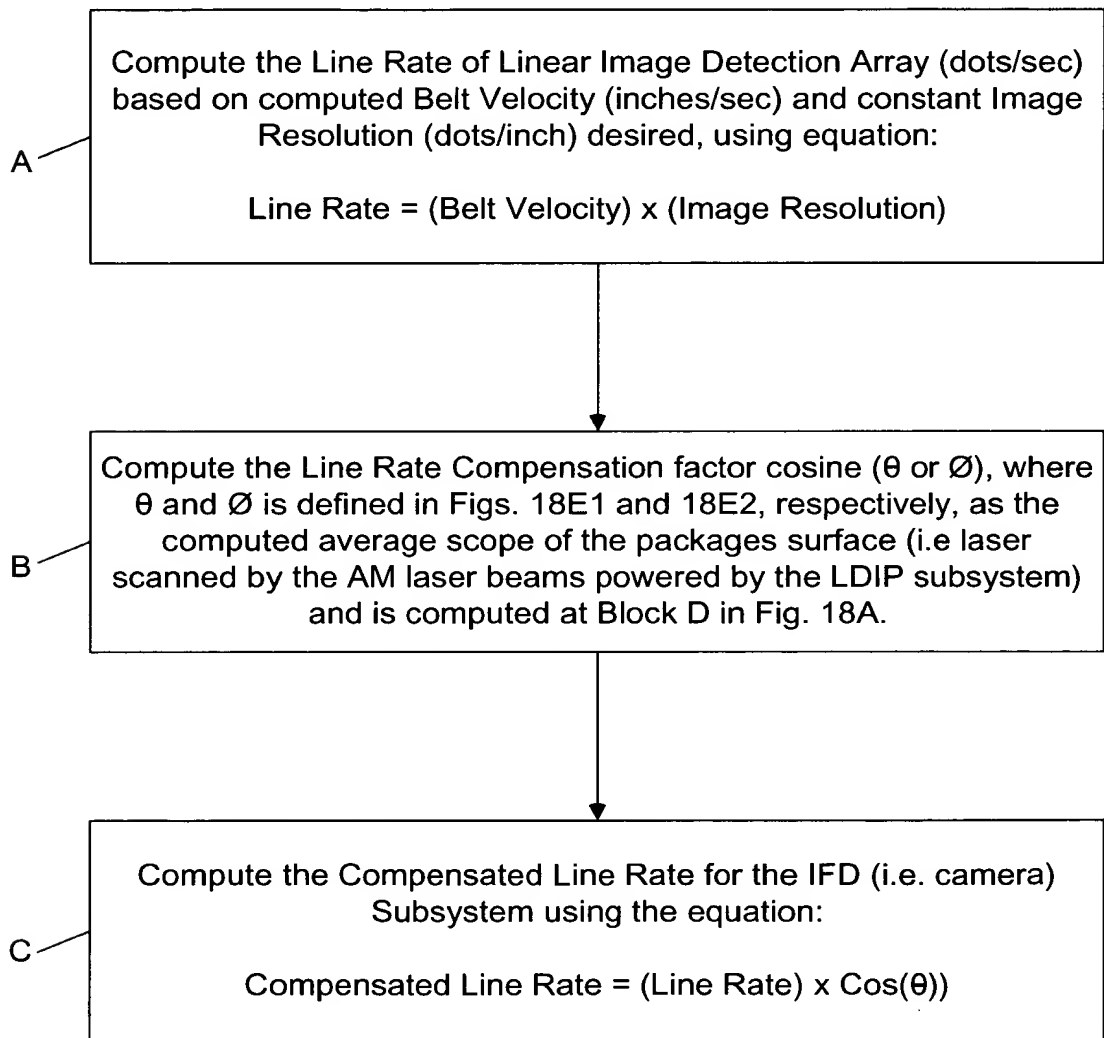


FIG. 18D

CASE 1:  
Top Down Imaging

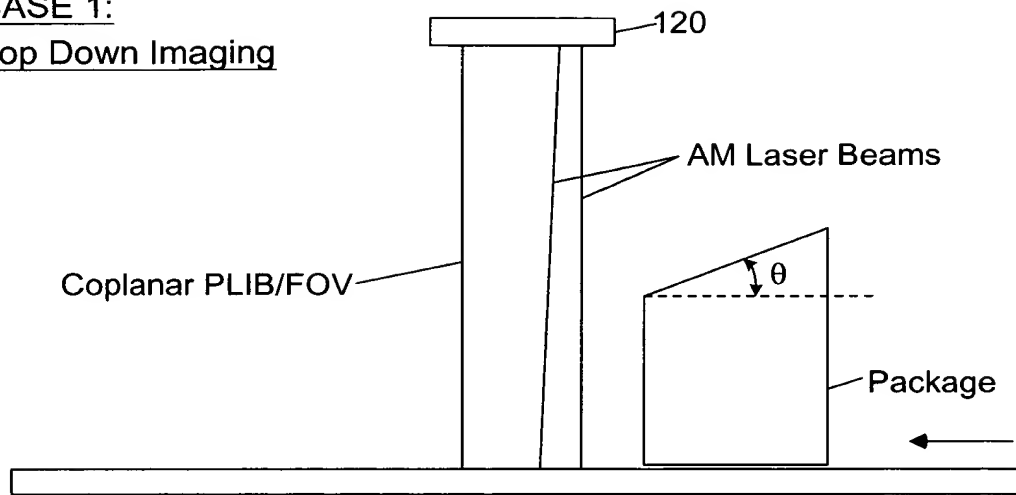


FIG. 18E1

CASE 2:  
Side Imaging

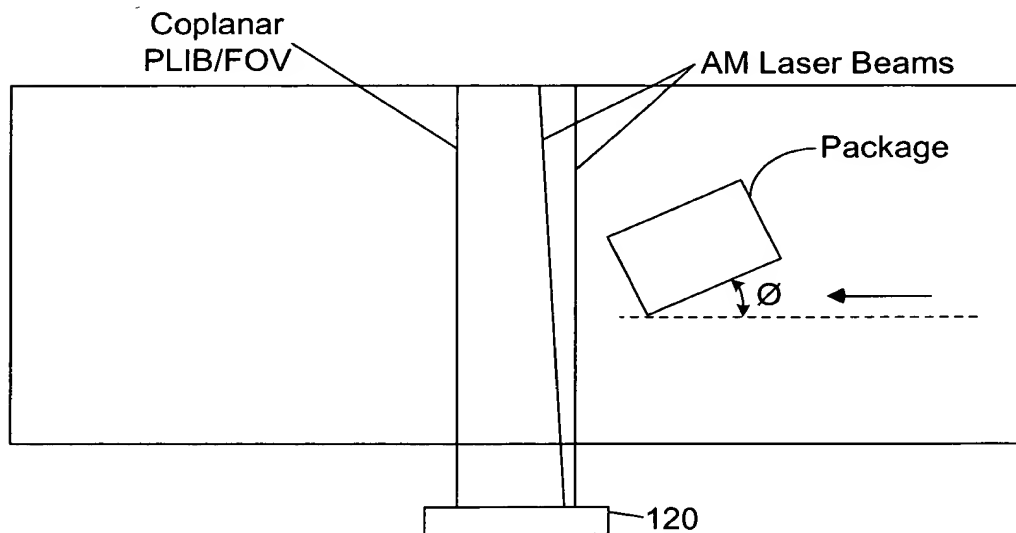
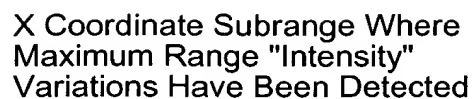


FIG. 18E2



### Package Data Buffer (FIFO)

A 20x20 grid of squares. Above the grid, the word 'Columns' is written with a horizontal arrow pointing to the right. To the left of the grid, the word 'Rows' is written with a vertical arrow pointing downwards.

FIG. 20



Zoom And Focus Lens Group Position  
Look-Up Table

Distance From Camera H (mm)	Zoom Group Distance (mm) Y (Zoom)	Focus Group Distance (mm) Y (Focus)
1000 1100 1200 1300 1400 1500 1600 1700 1800 1900  (Use Interpolation Techniques For Working Distances Between Listed Points In Table)	21.57489228 19.38089696 17.10673434 14.77137314 12.39153565 9.979114358 7.540639114 5.078794775 2.595989366 0.099972739	2.47E-05 10.99009783 20.65783177 29.10917002 36.47312595 42.87845436 48.44003358 53.25495831 57.40834303 60.98883615

FIG. 21



\* Note: The focal distance and zoom (eff. focal length) of camera lens are coupled (inter-dependant) in this commercial embodiment.

### Camera Has A Fixed Aperture F56 Focus And Zoom Lens Movement vs. Working Distances

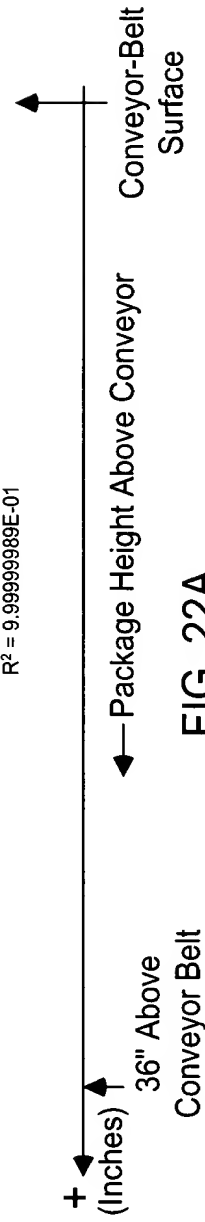
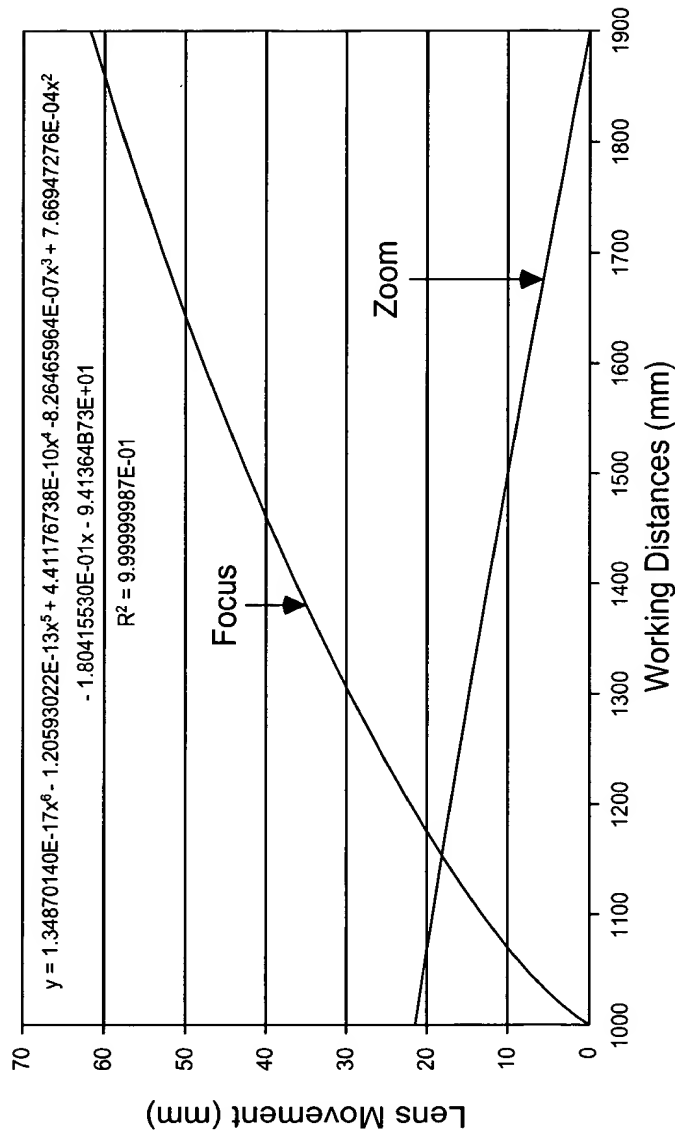


FIG. 22A



Photo-Integration Time Look-Up Table

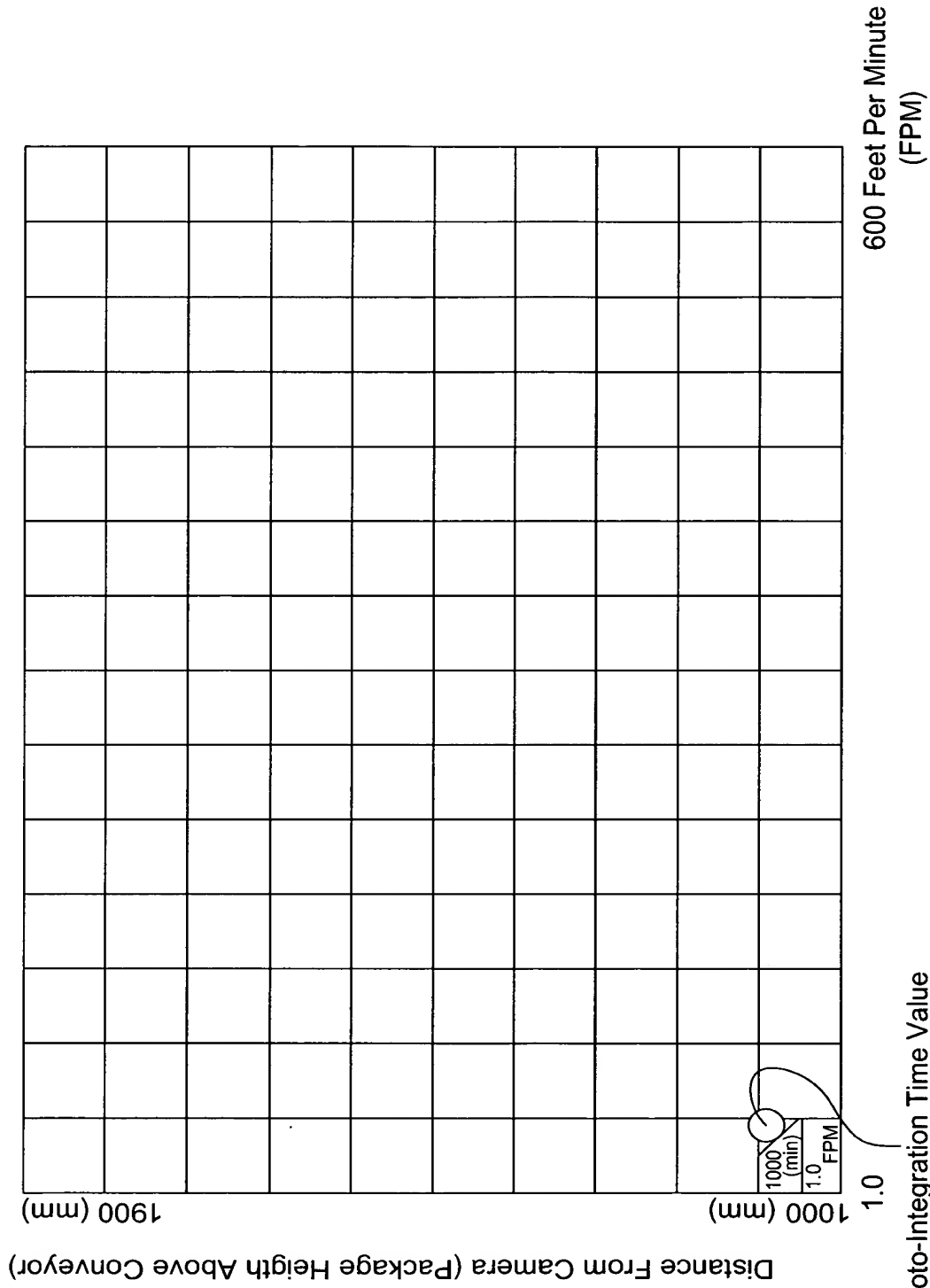


Photo-Integration Time Value  
That Ensures Square Image  
Pixels (1:1 aspect ratio)

FIG. 22B

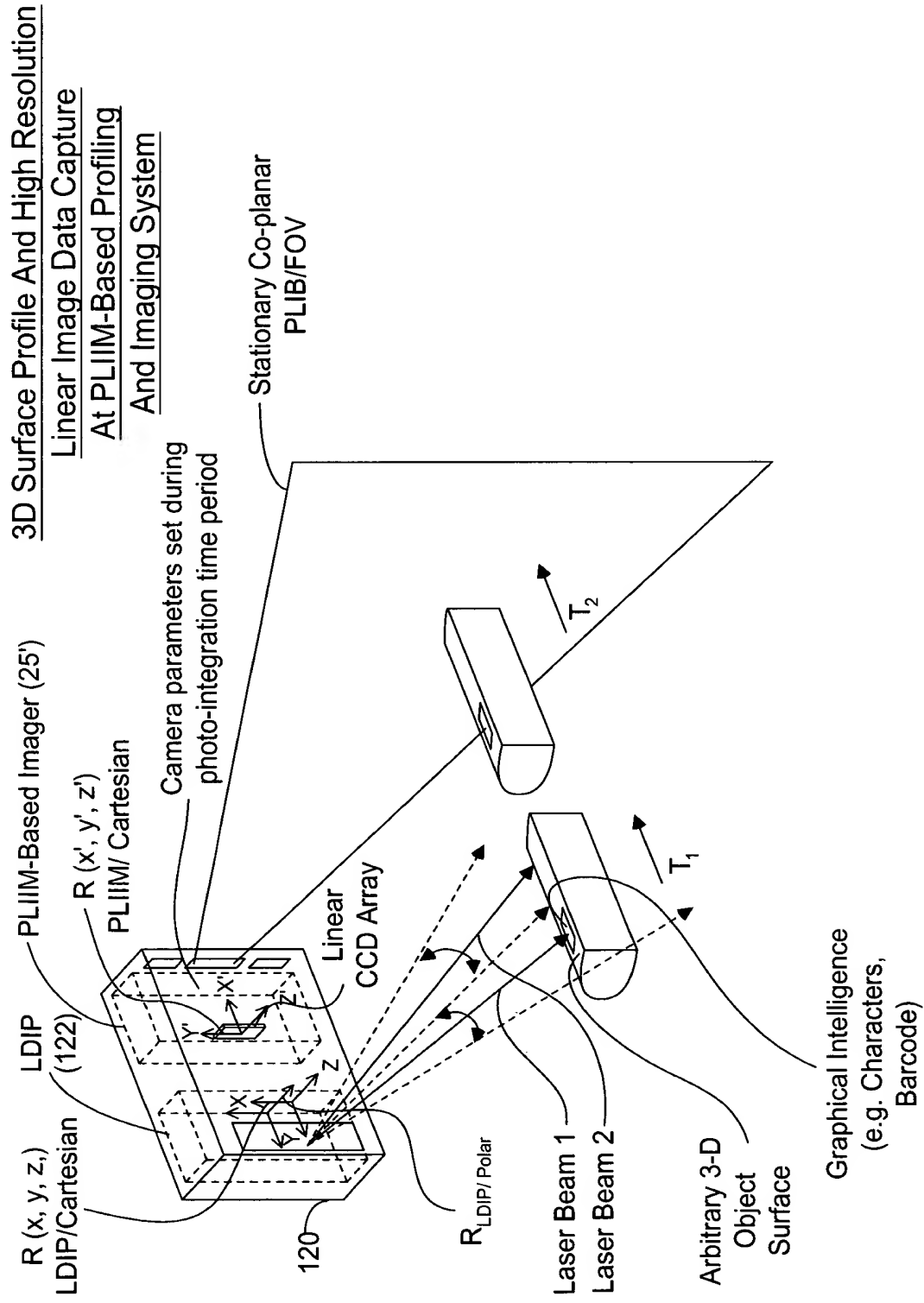


FIG. 23A

# Geometrical Modelling Of Arbitrary 3-D Object Surface At Image Processing Computer

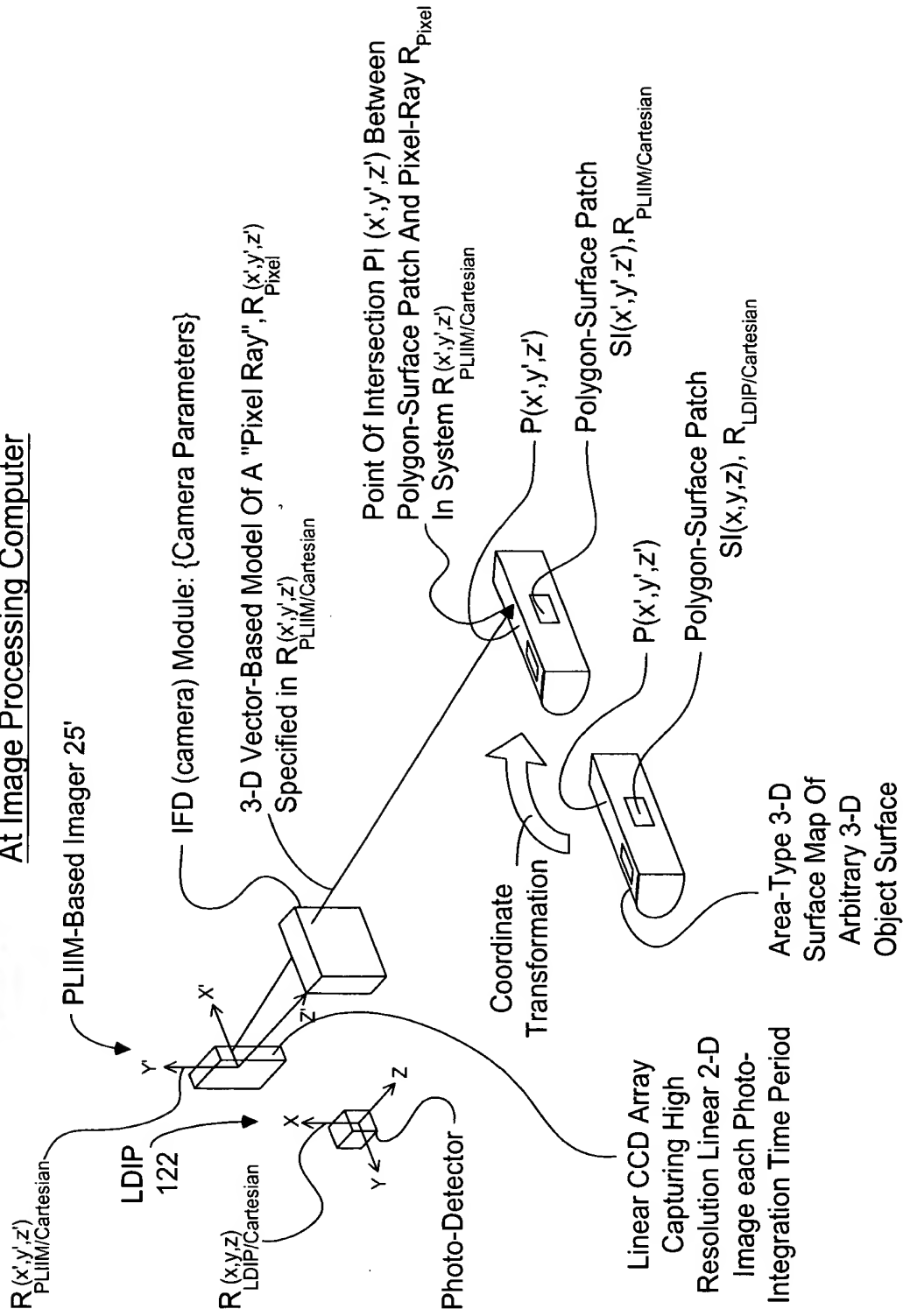


FIG. 23B





METHOD OF AND APPARATUS FOR PERFORMING AUTOMATIC  
RECOGNITION OF GRAPHICAL INTELLIGENCE CONTAINED IN 2-D  
IMAGES CAPTURED FROM ARBITRARY 3-D OBJECT SURFACES

STEP 1: At the unitary PLIIM-based object imaging and profiling system, use the laser doppler imaging and profiling (LDIP) subsystem employed therein to (i) consecutively capture a series of linear 3-D surface profile maps on a targeted arbitrary (e.g. non-planar or planar) 3-D object surface bearing forms of graphical intelligence and (ii) measure the velocity of the arbitrary 3-D object surface, wherein the polar coordinates of each point in the captured linear 3-D surface profile map are specified in a local polar coordinate system  $R_{LDIP/polar}$ , symbolically embedded within the LDIP subsystem.

A

STEP 2: At the unitary PLIIM-based object imaging and profiling system, use coordinate transforms to automatically convert the polar coordinates of each point  $p(\alpha, R)$  in the captured linear 3-D surface profile map into x,y, z Cartesian coordinates specified as  $p(x,y,z)$  in a local Cartesian coordinate system  $R_{LDIP/Cartesian}$ , symbolically embedded within the LDIP subsystem.

B

STEP 3: At the unitary PLIIM-based object imaging and profiling system, use the PLIIM-based imager employed therein to consecutively capture high-resolution linear 2-D images of the arbitrary 3-D object surface bearing forms of graphical intelligence (e.g. symbol character strings), wherein (i) the  $x'$ ,  $y'$  coordinates of each pixel in each said captured high-resolution linear 2-D image is specified in local Cartesian coordinate system  $R_{PLIIM/Cartesian}$  symbolically embedded within the PLIIM-based imager, and (ii) the intensity value of the pixel  $I(x',y')$  is associated with the  $x'$ ,  $y'$  Cartesian coordinates of the image detection element in the linear image detection array at which the pixel is detected, and (iii) wherein also the planar laser illumination beam (PLIB) of the PLIIM-based imager is spaced from the amplitude modulated (AM) laser scanning beam of the LDIP subsystem is about D centimeters.

C

A

FIG. 23C1

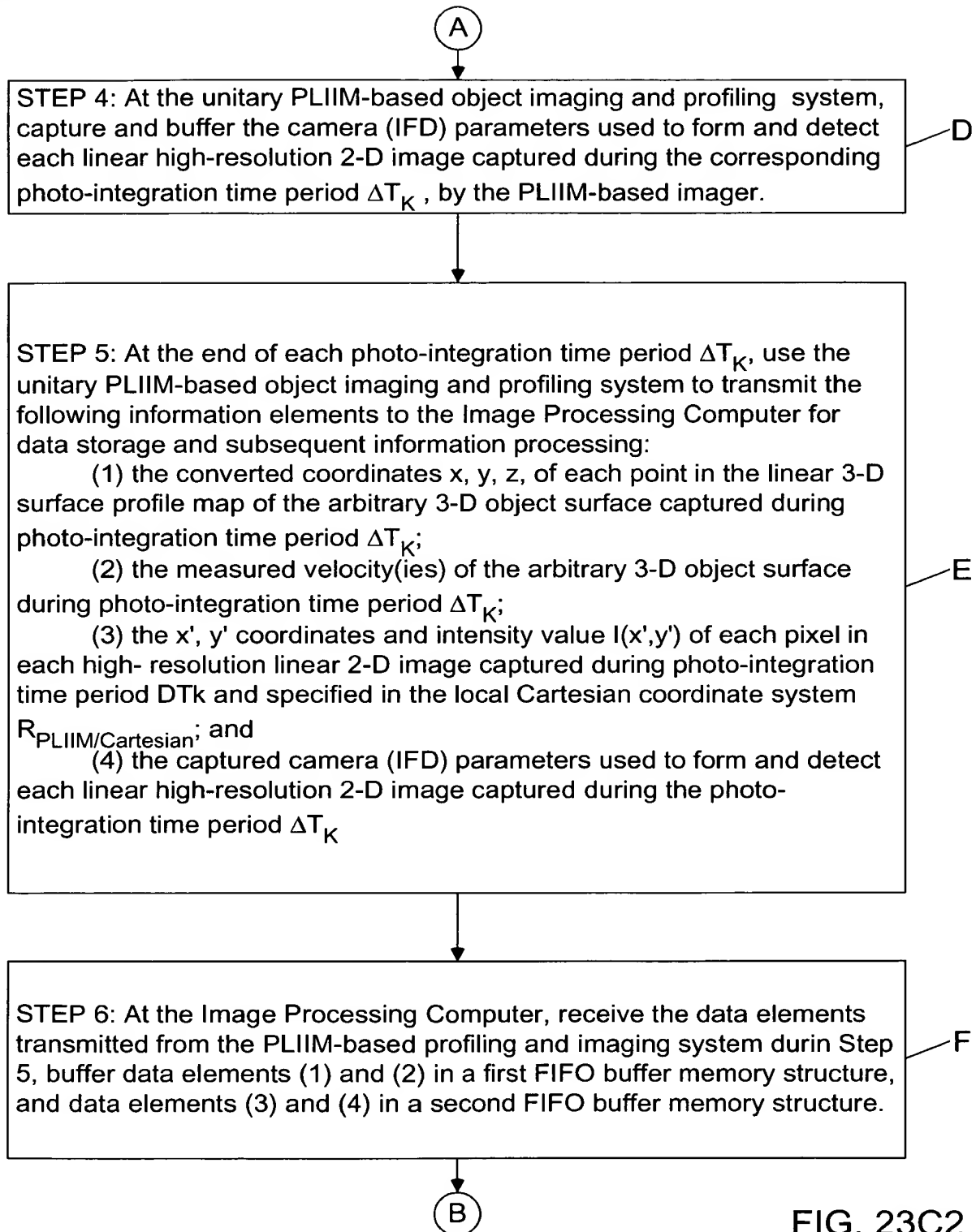


FIG. 23C2

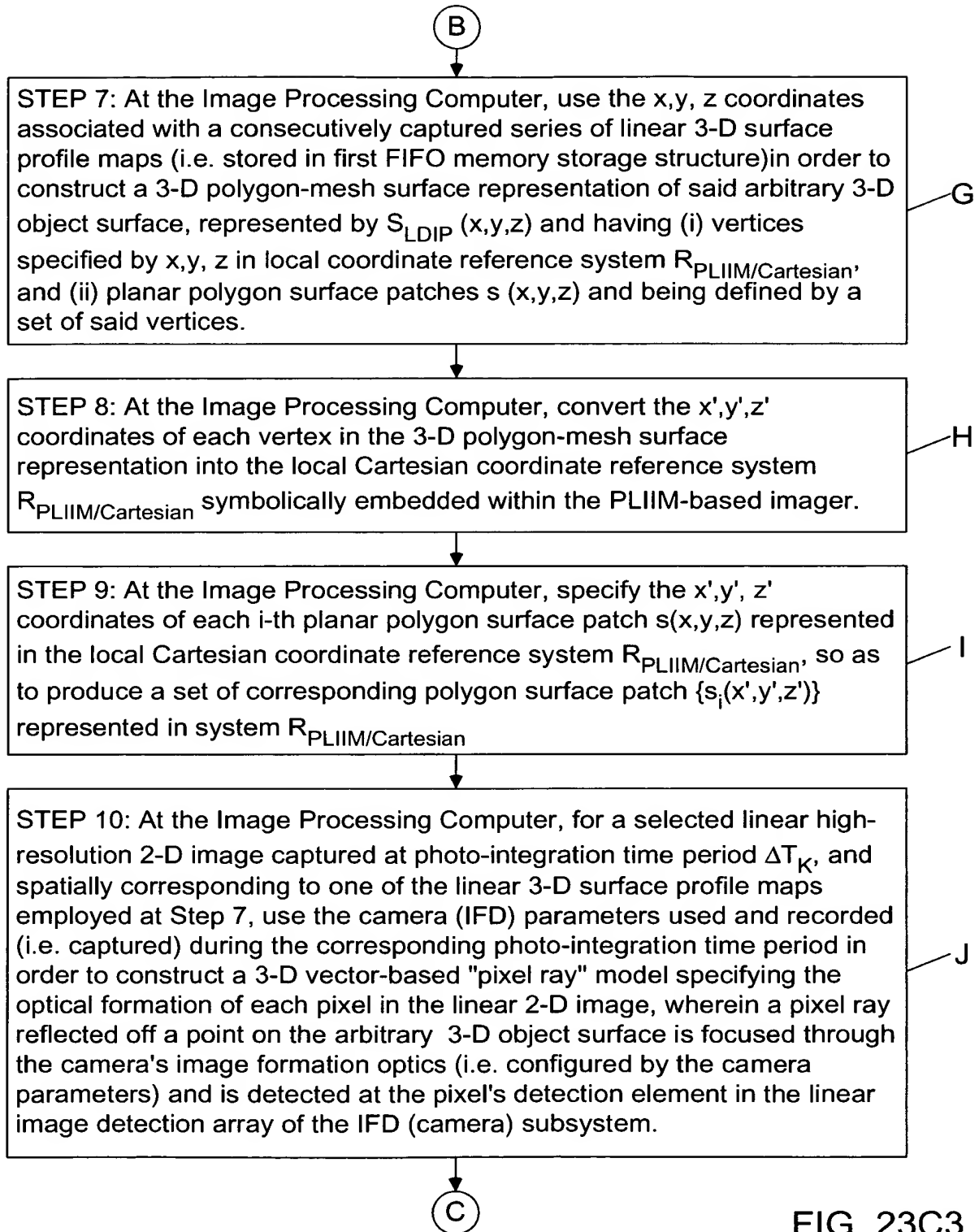


FIG. 23C3

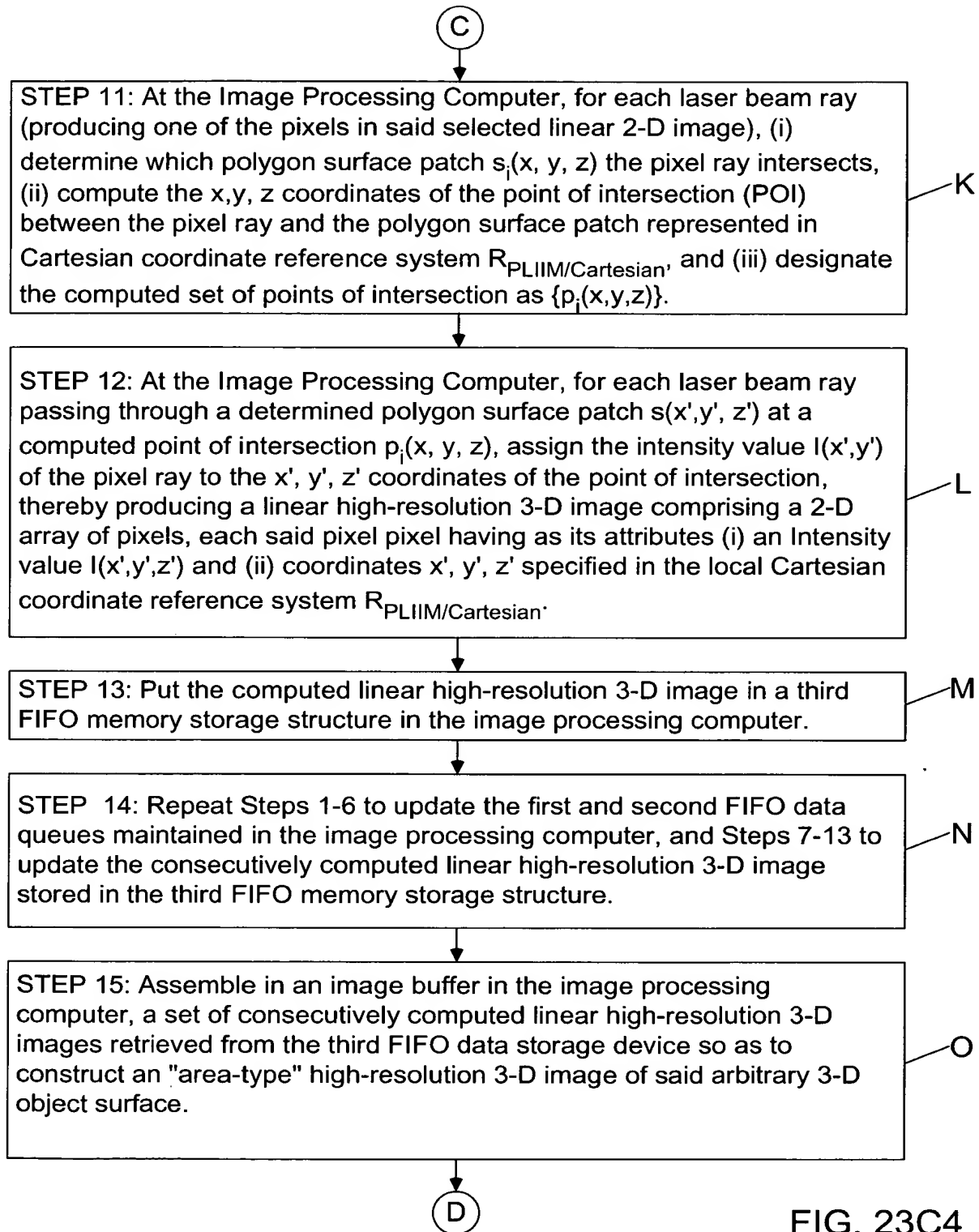


FIG. 23C4

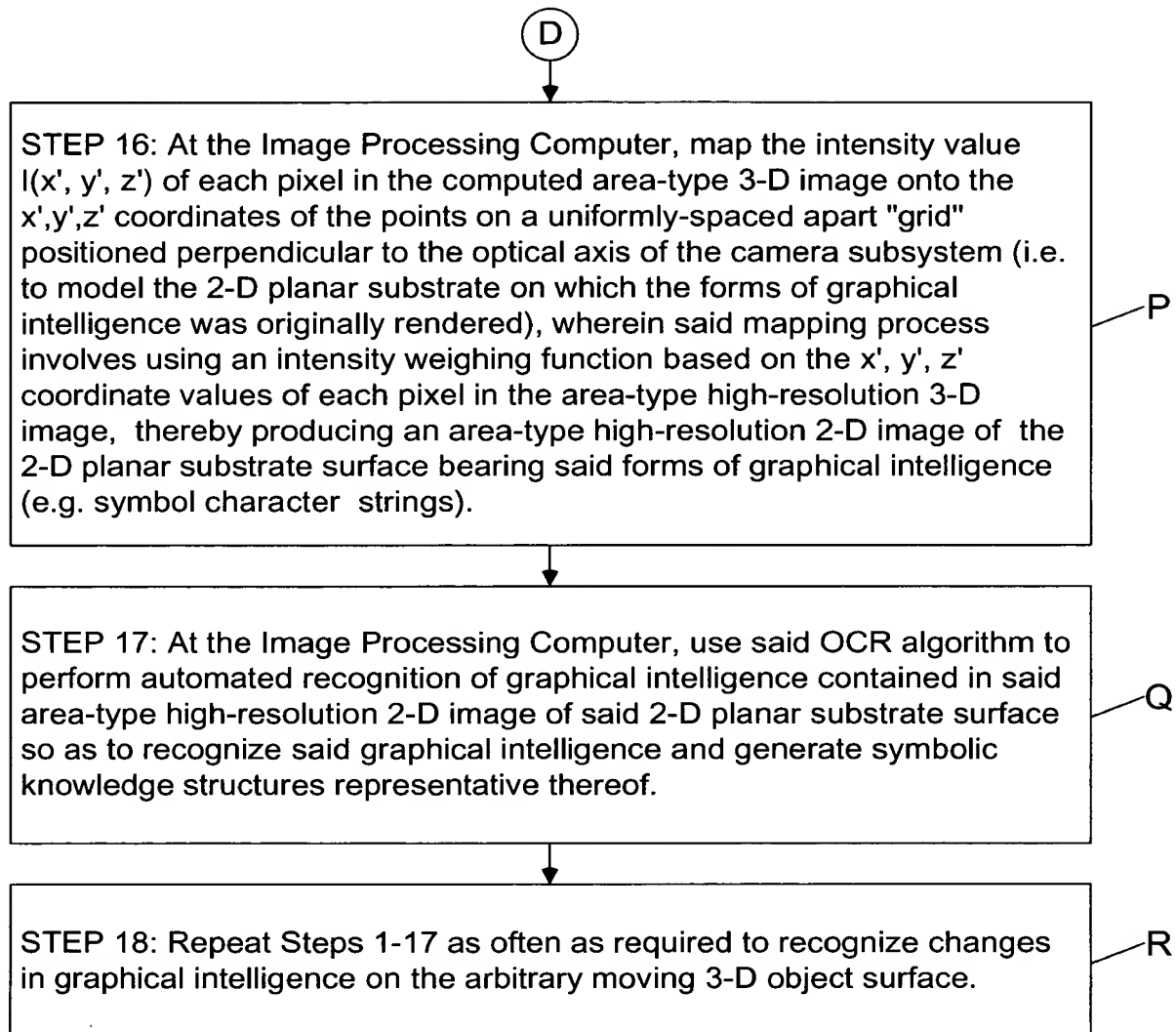


FIG. 23C5

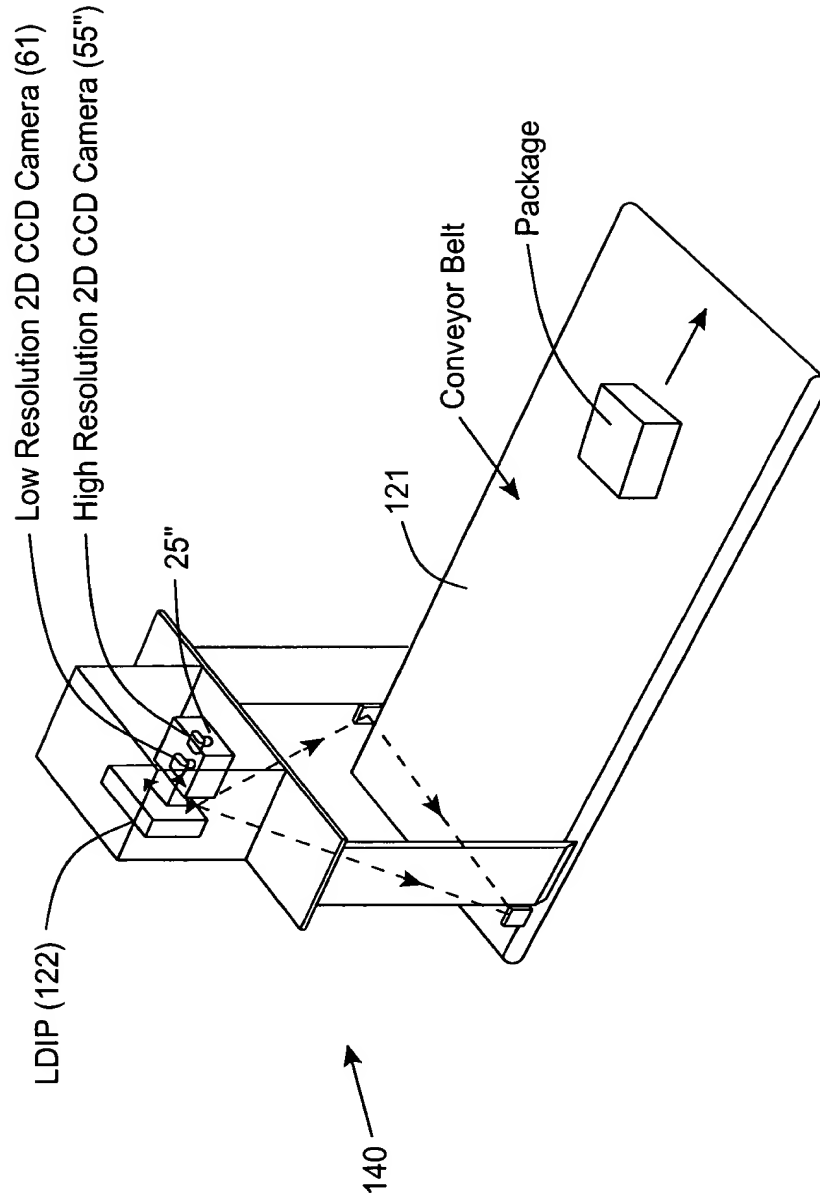


FIG. 24

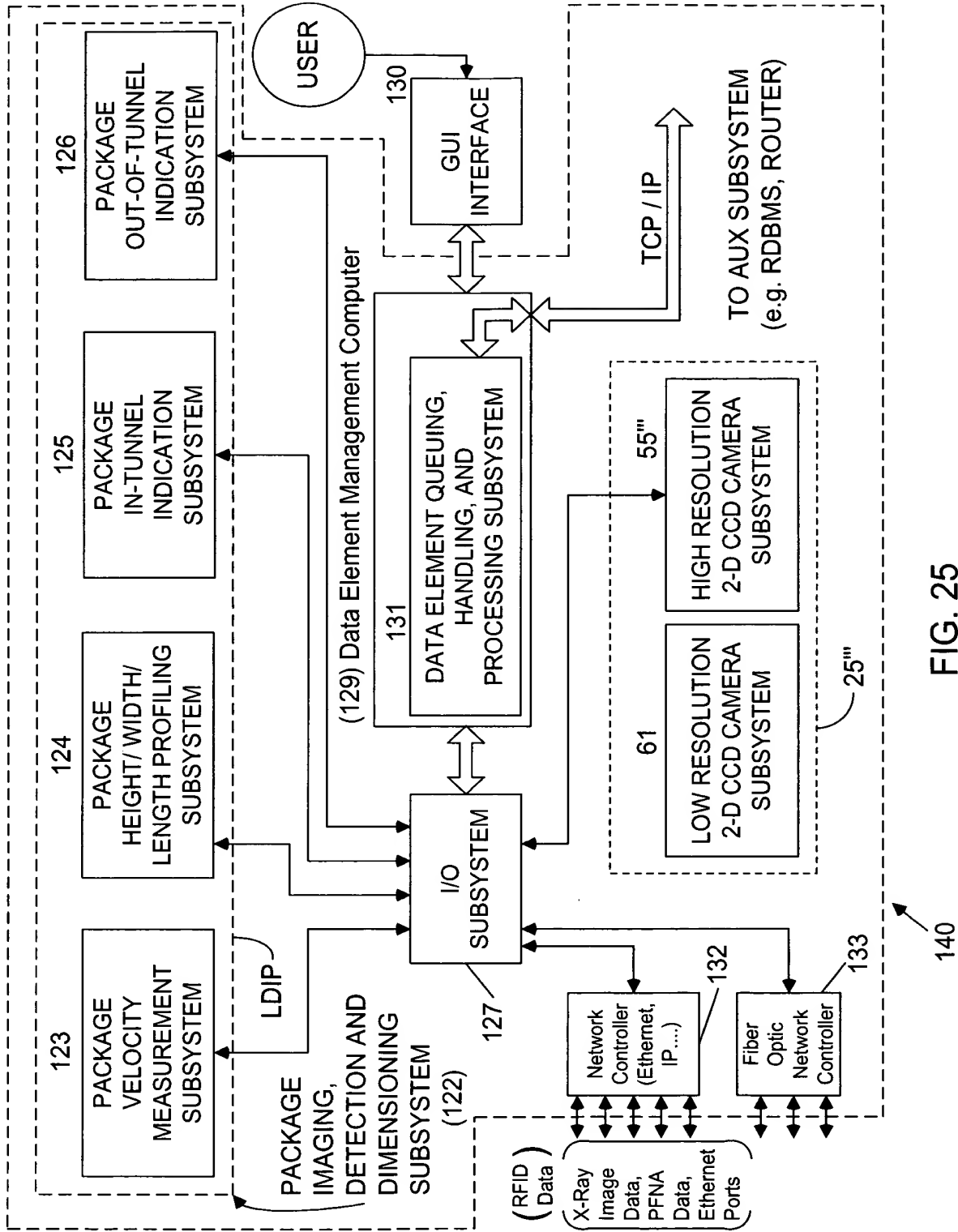


FIG. 25

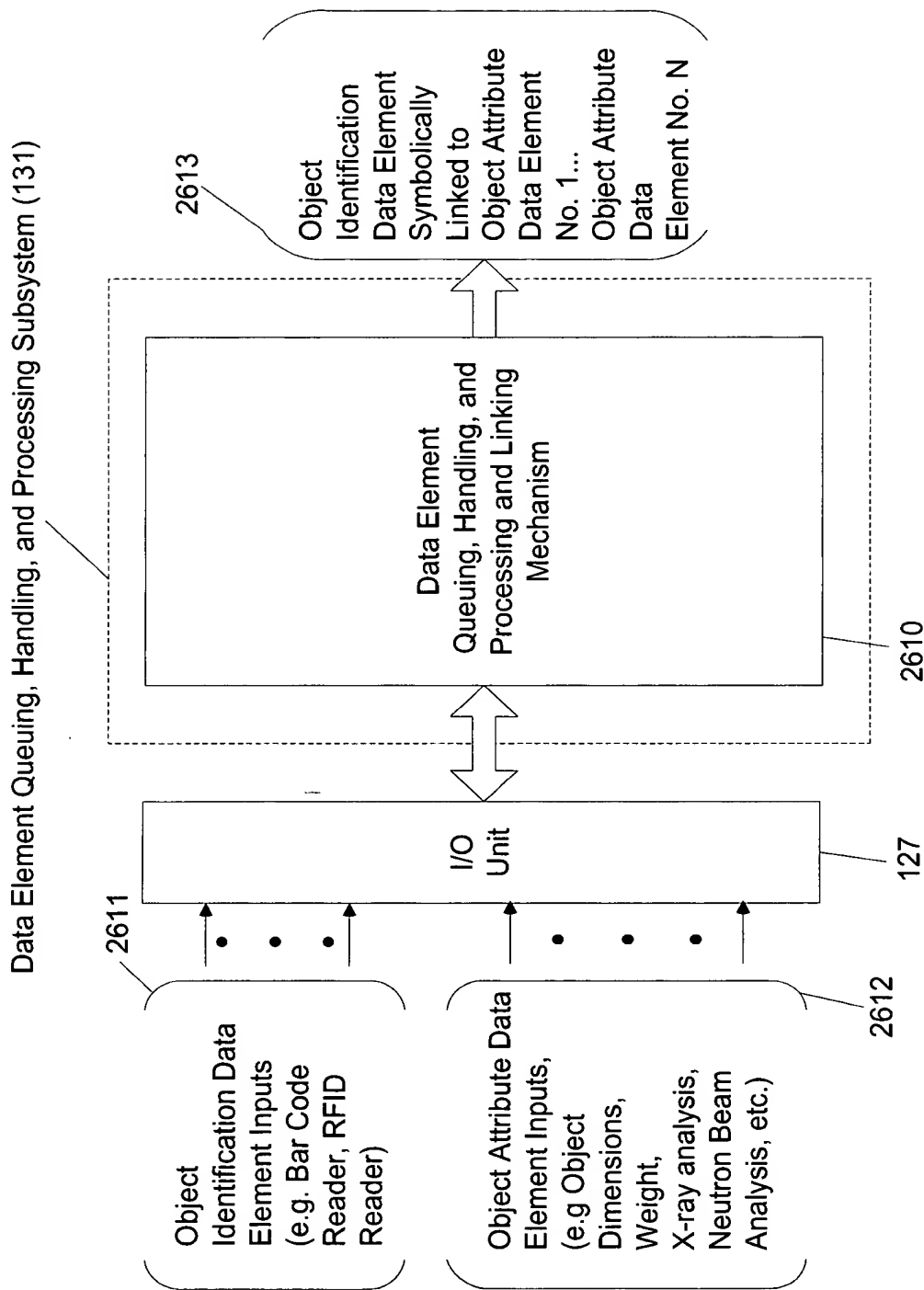


FIG. 25A



Specification of Object Detection, Tracking, and Identification and Attribute-Acquisition Capabilities of a Configured System or Network.

- Primary Network and/ or System Functions:
- A. Specification of Object Detection and Tracking Capability of System
- B. Specification of Object Identification Capability of System
- C. Specification of Object Attribute Acquisition Capability of System

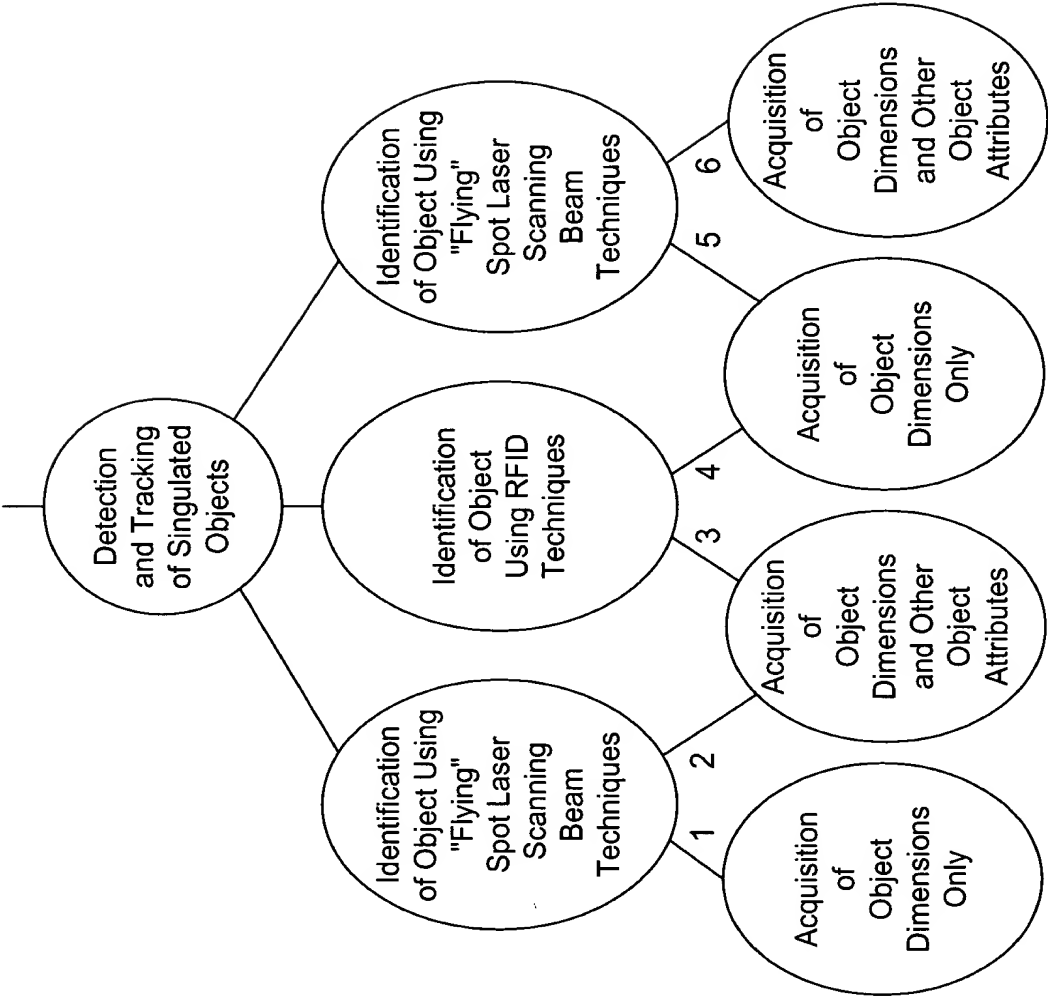


FIG. 25B-1

Specification of Object Detection, Tracking, and Identification and  
 Attribute-Acquisition Capabilities of a Configured System or Network.

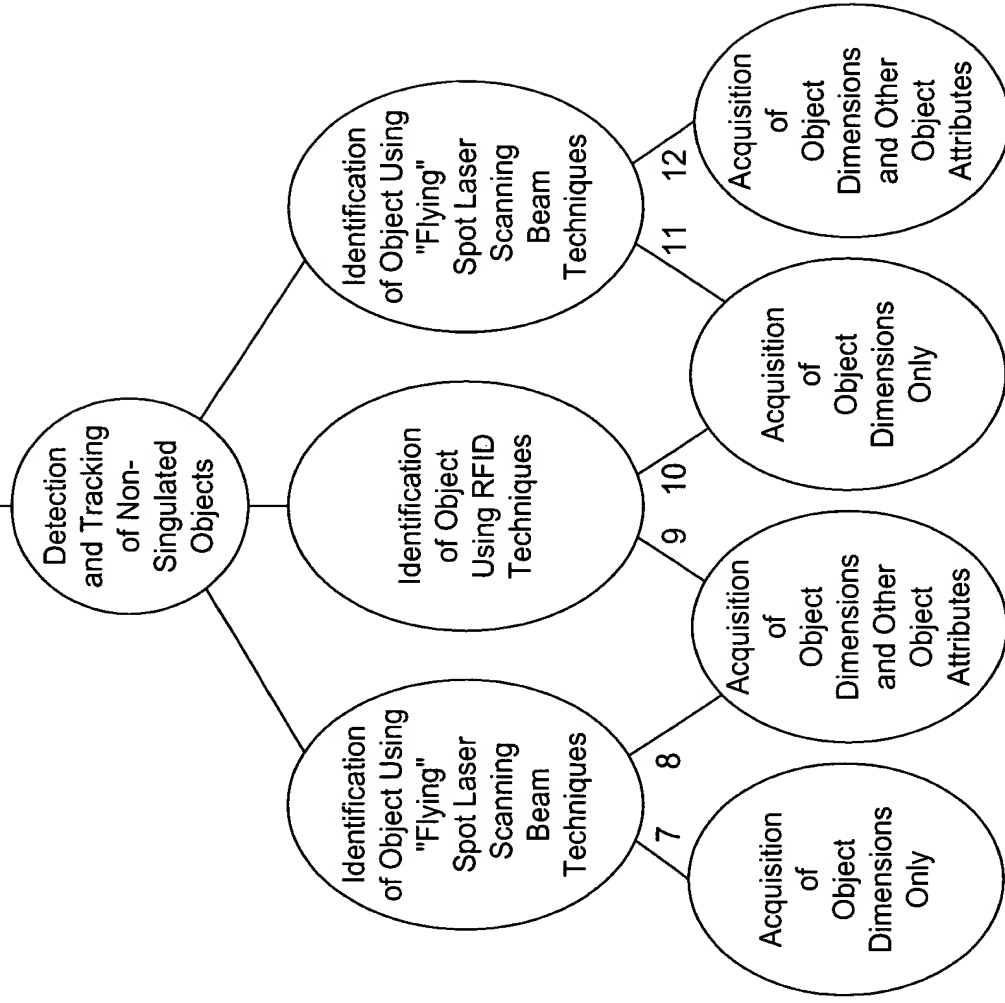


FIG. 25B-2

Primary Network and/ or System Functions:	
A. Specification of Object Detection and Tracking Capability of System	
B. Specification of Object Identification Capability of System	
C. Specification of Object Attribute Acquisition Capability of System	

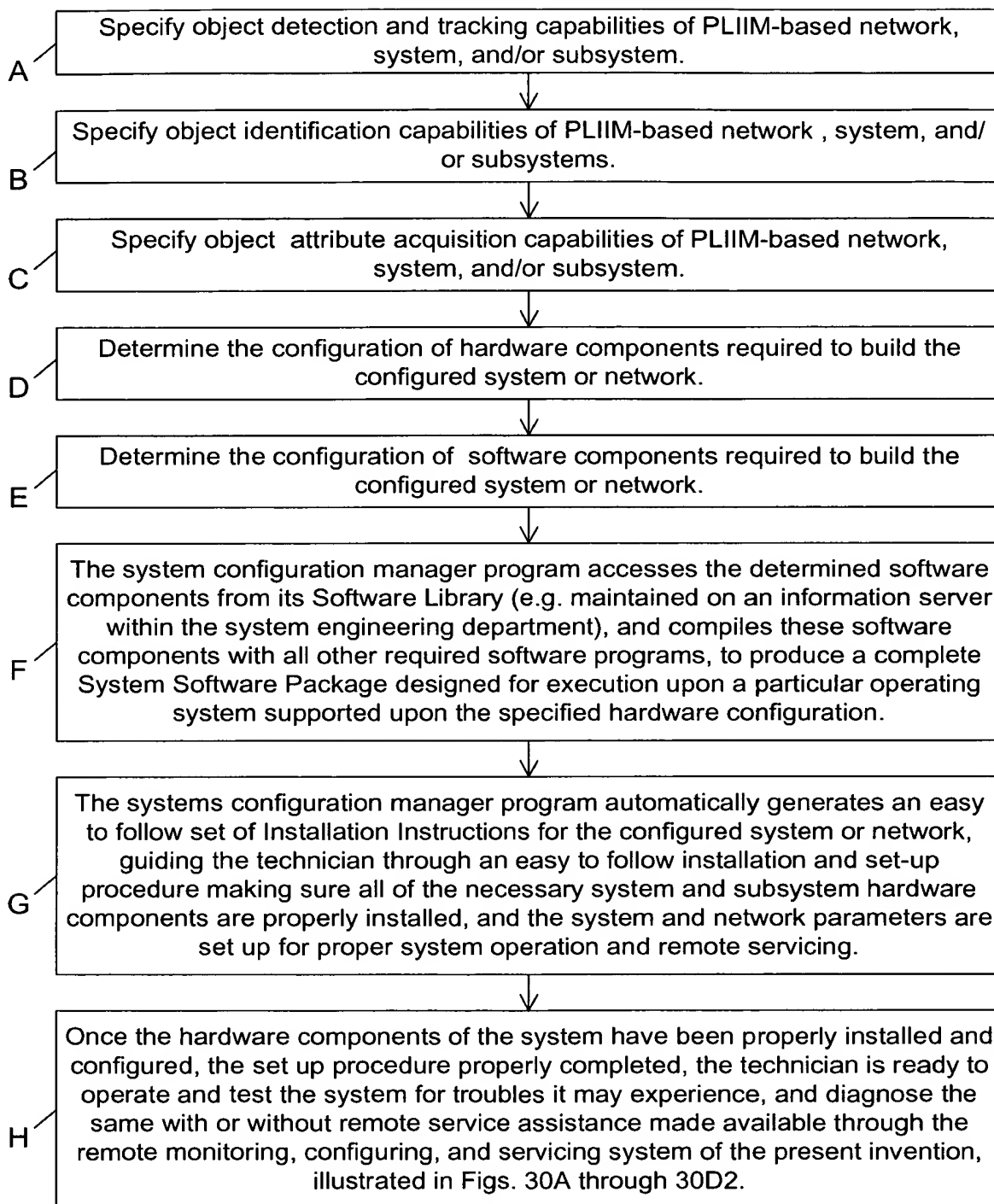


FIG. 25C

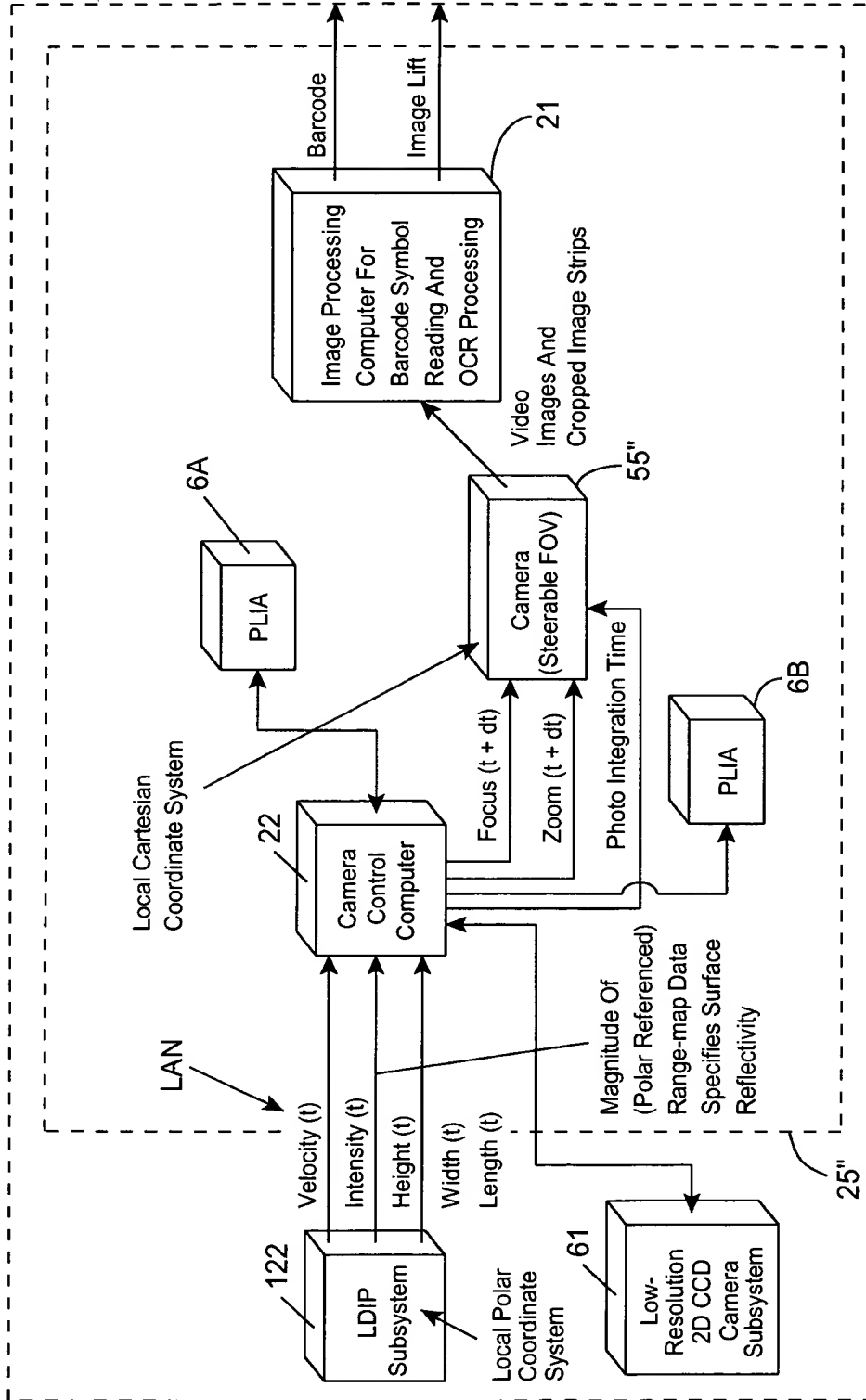


FIG. 26

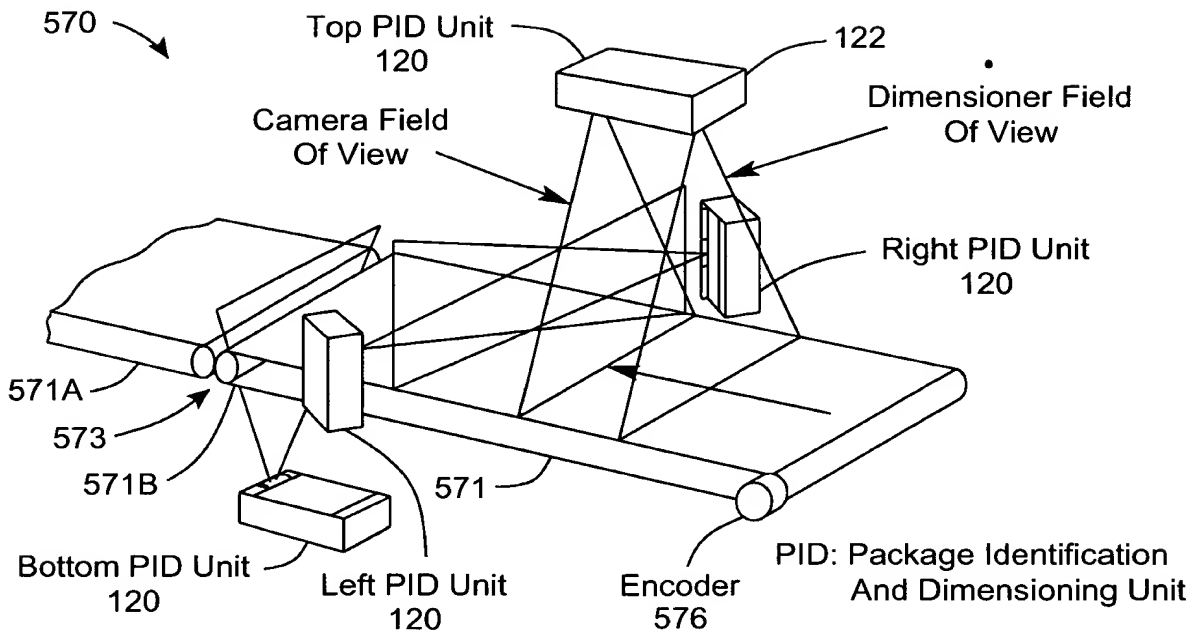


FIG. 27

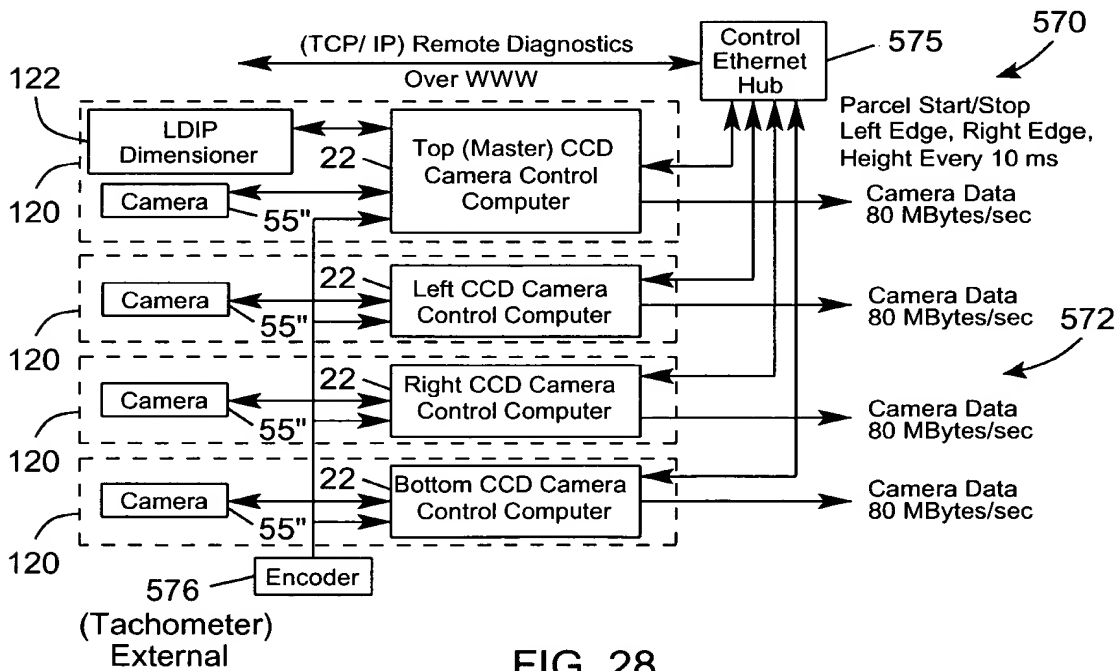


FIG. 28

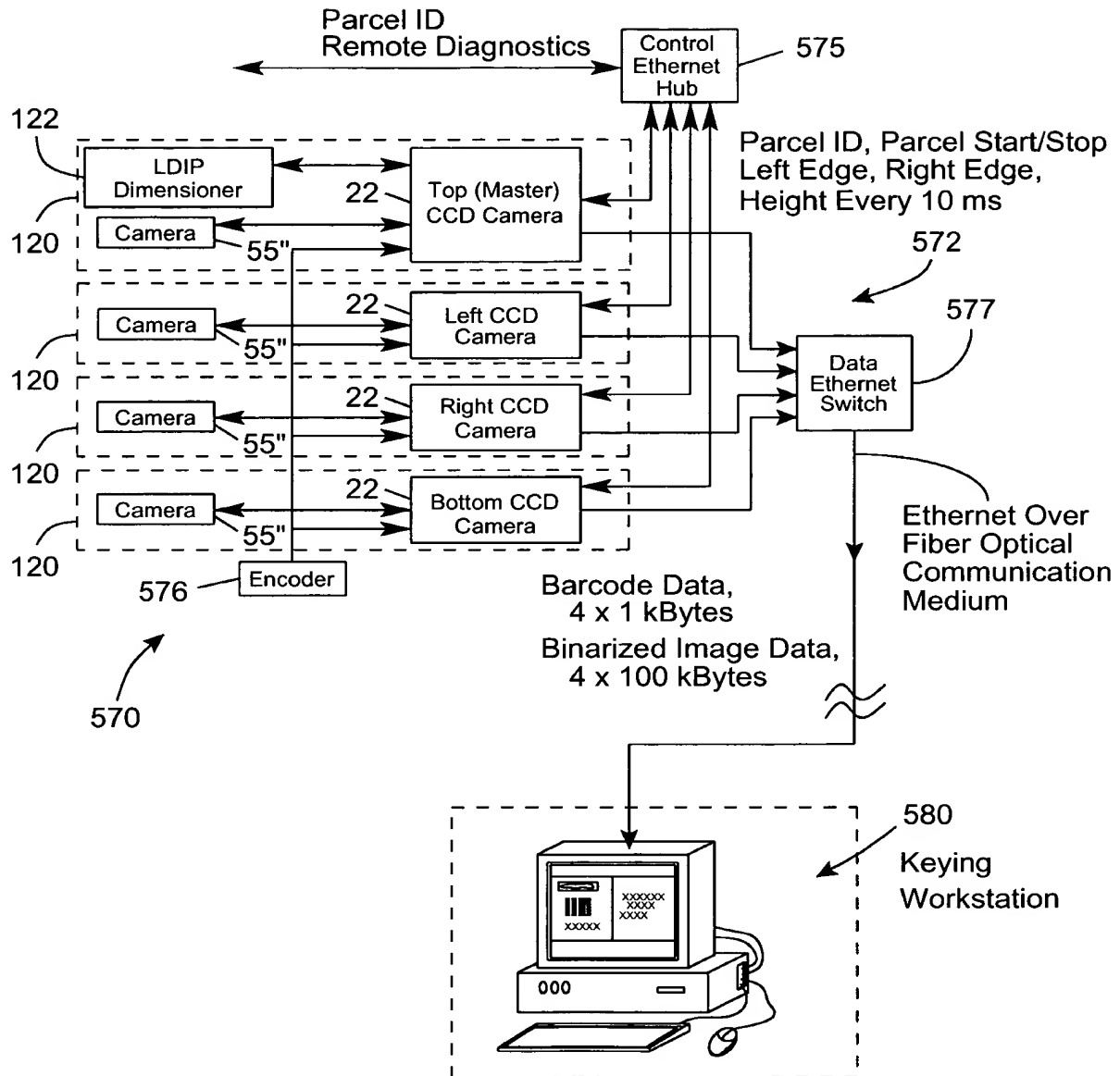


FIG. 29

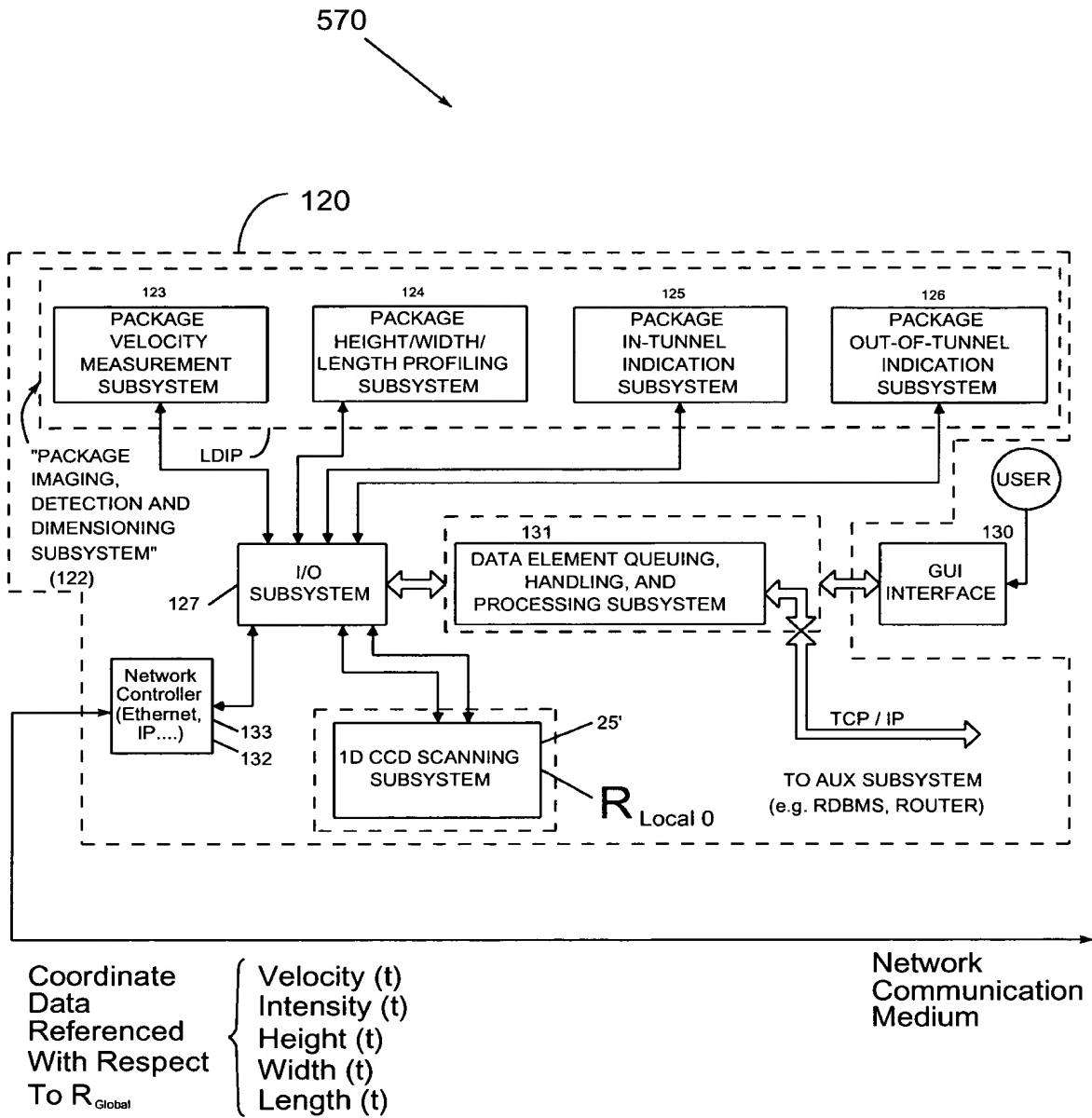


FIG. 30-1

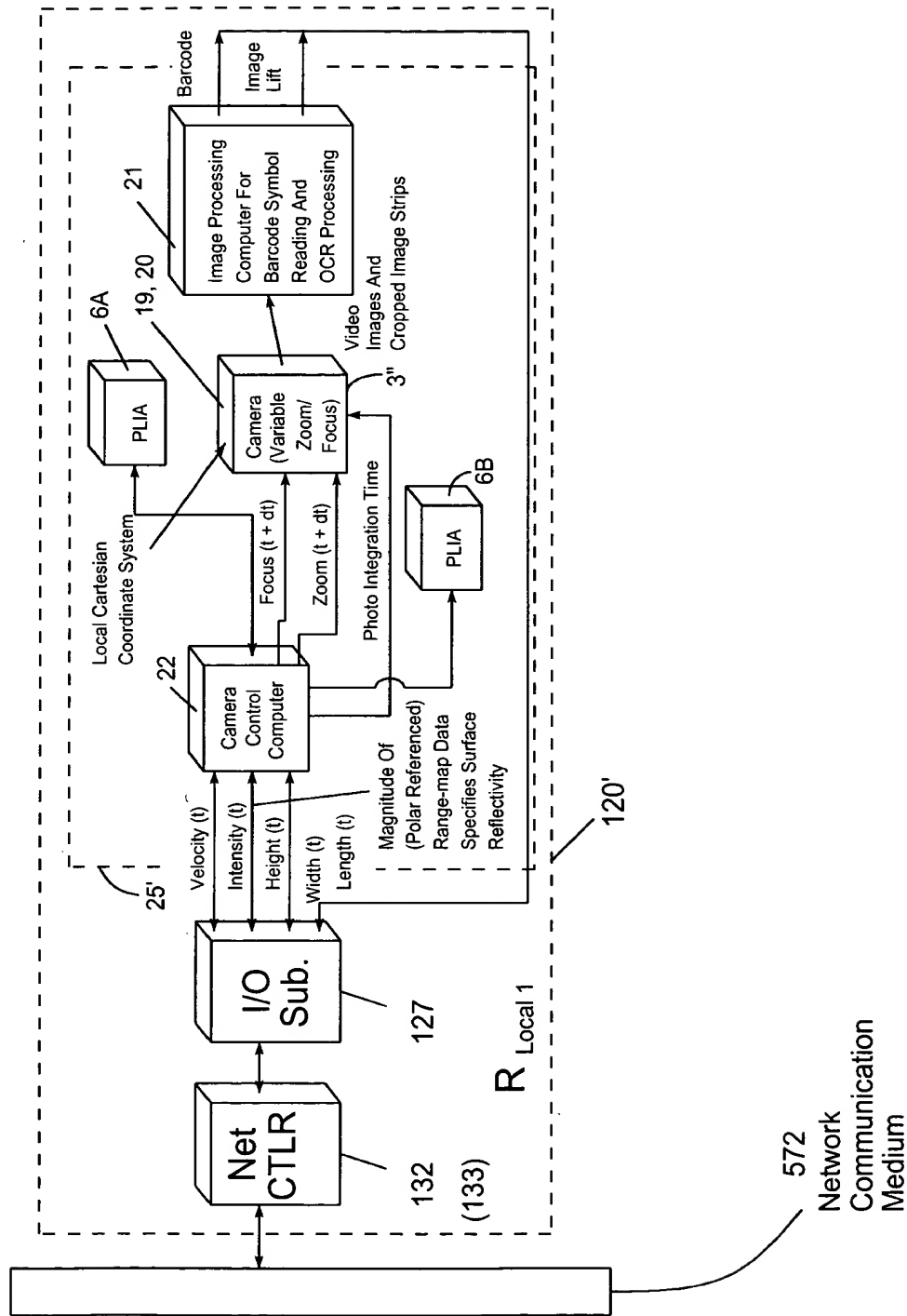


FIG. 30-2



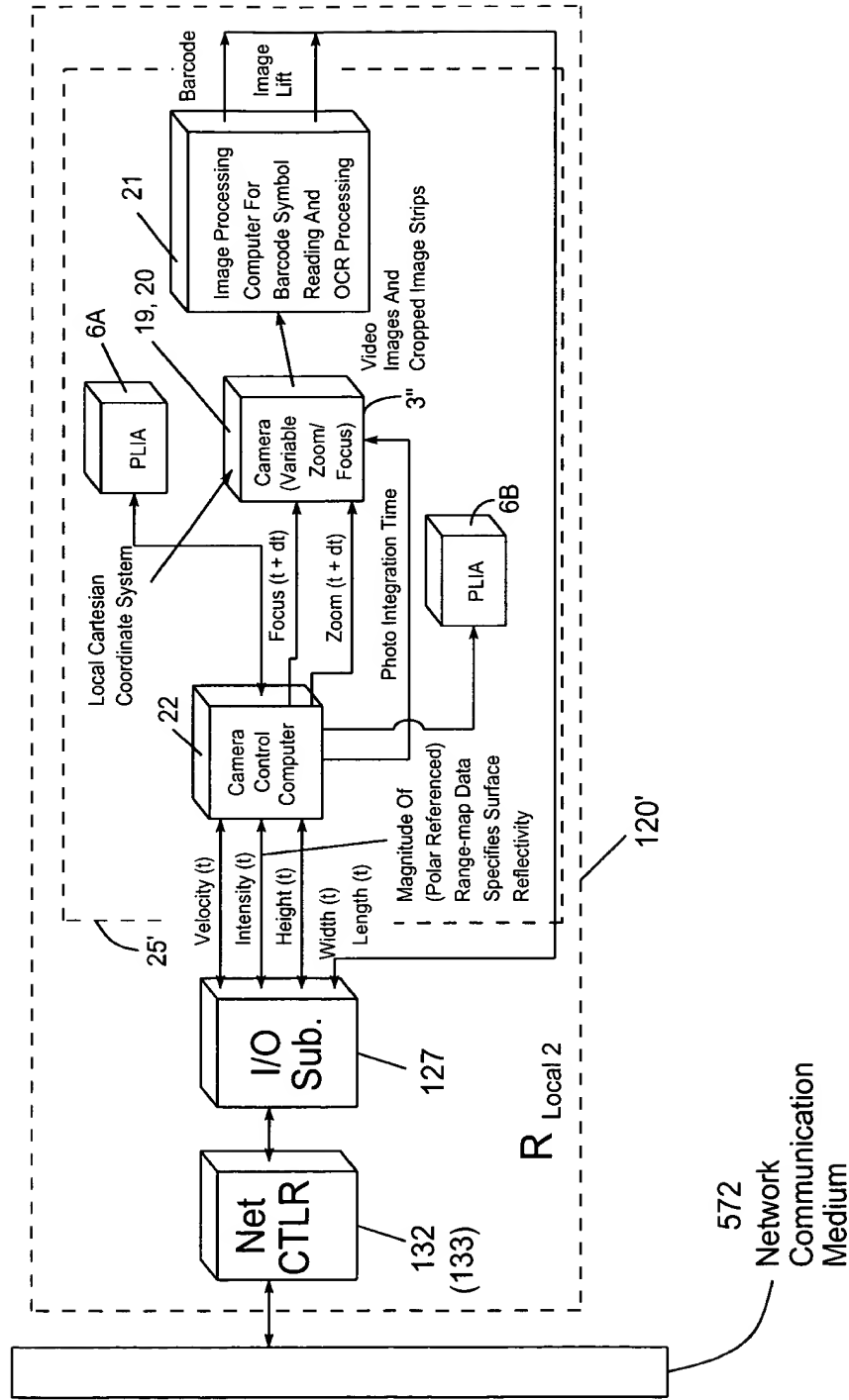
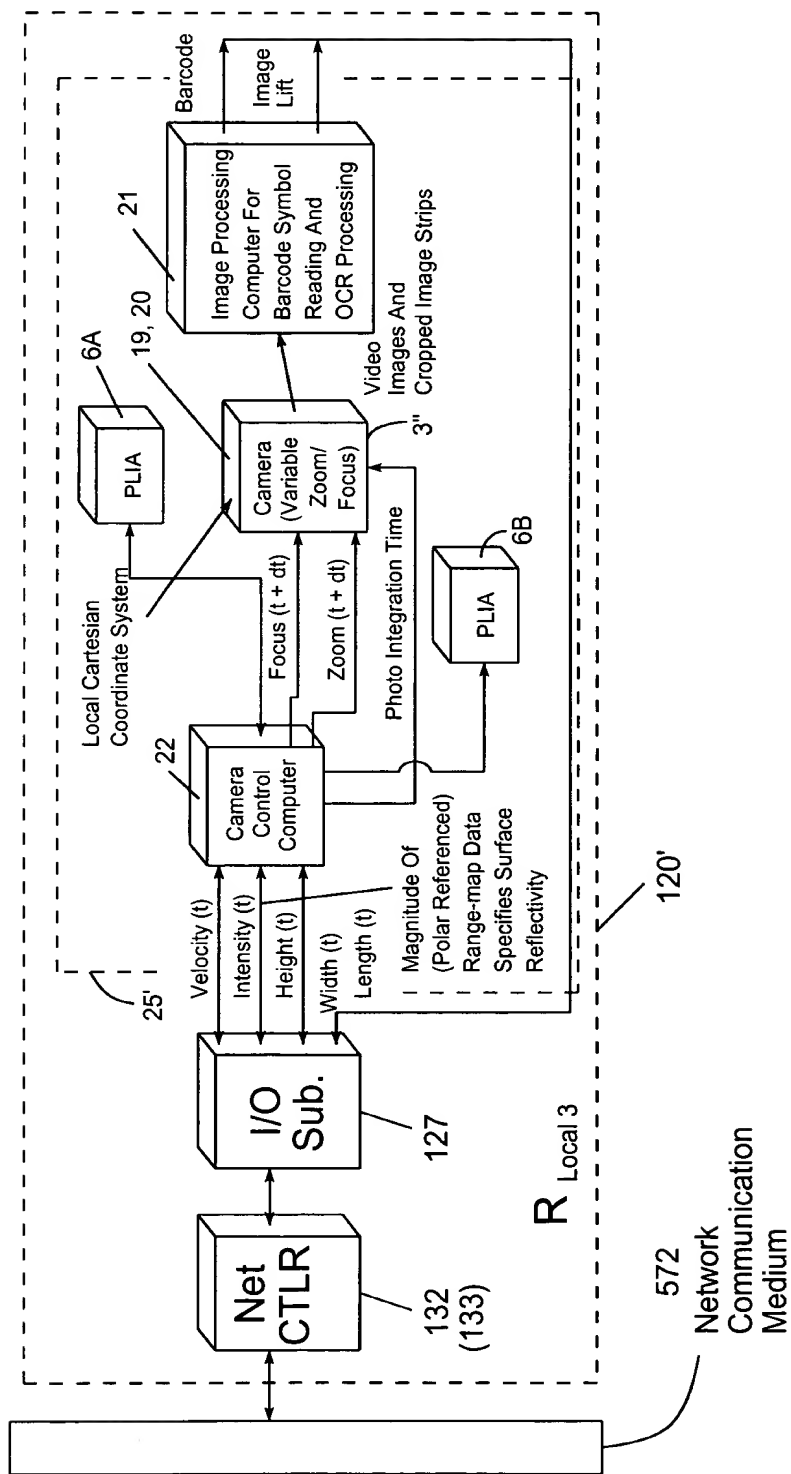


FIG. 30-3



**FIG. 30-4**

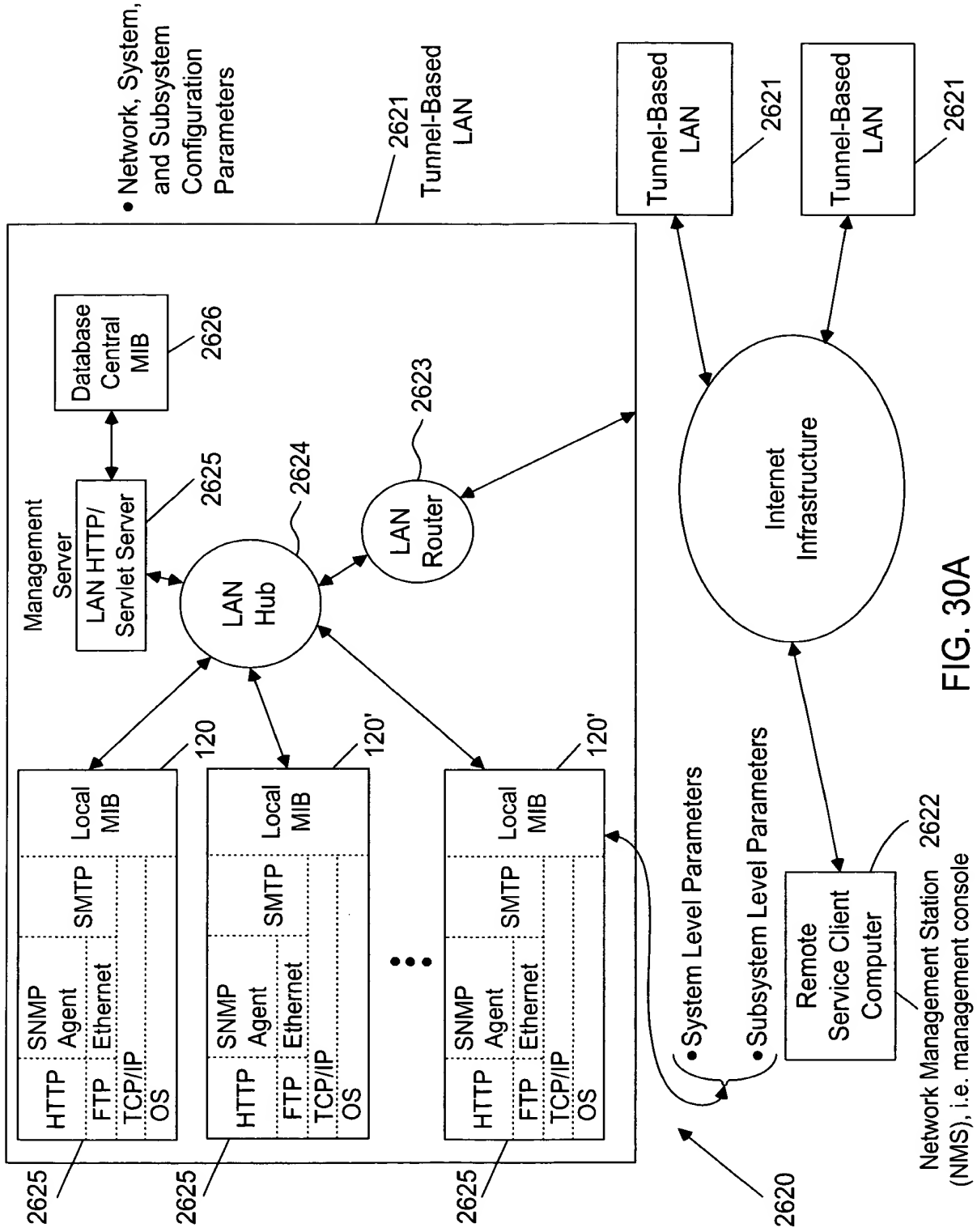


FIG. 30A

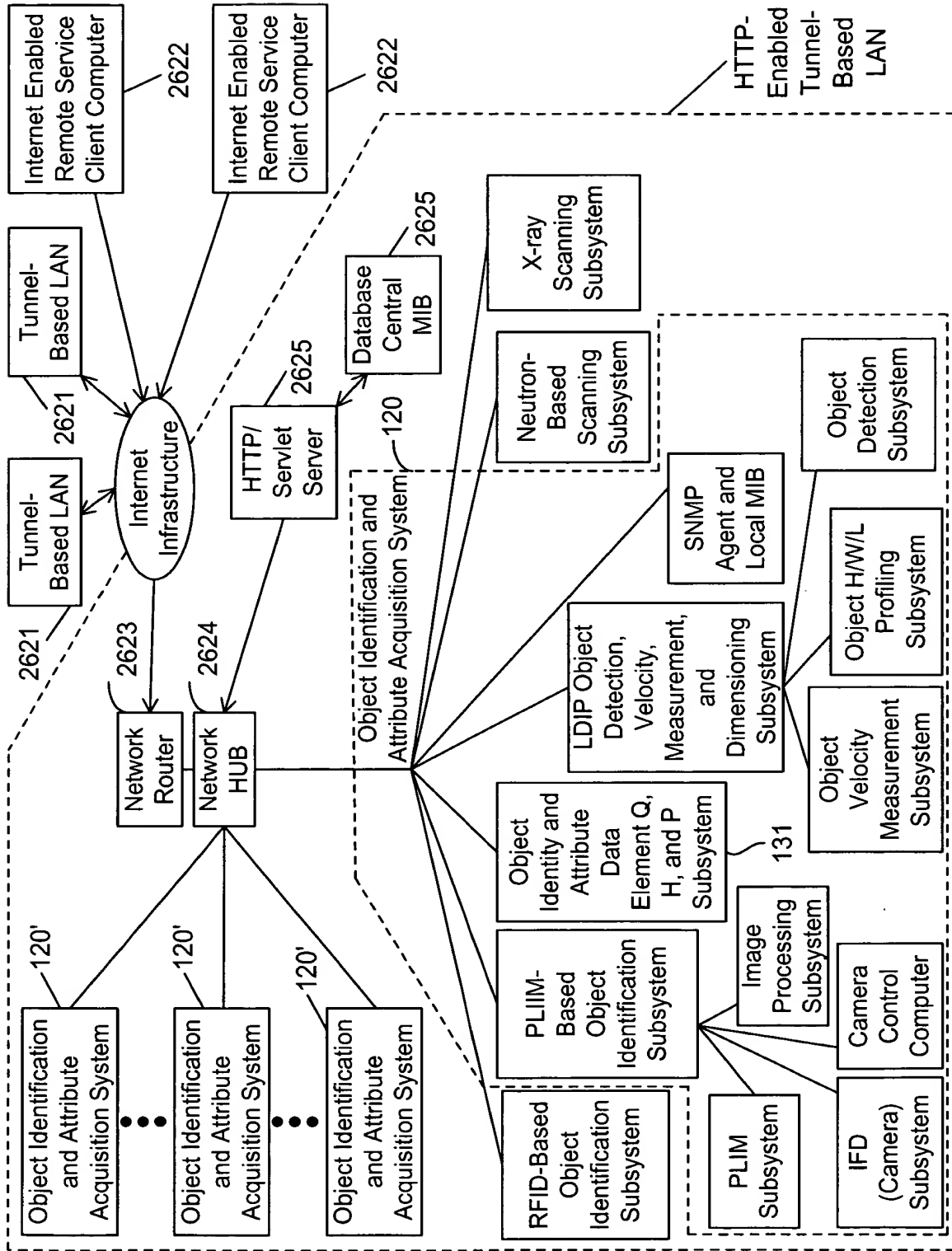


FIG. 30B



### Network Configuration Parameters:

[ Router IP address; no. of nodes (i.e. systems) in LAN; passwords, LAN location; name of customer facility; technical contact; phone no.; domain name; object identity codes; object attribute acquisition codes;.....]

### System Configuration Parameters:

[ System IP Address; passwords; object identity codes; object attribute acquisition codes;....]

These subsystems generate object identity parameters

This system links object attribute data element parameters (i.e. object identity data element) to corresponding object identity parameters (i.e. object attribute data element)

These subsystems generate object attribute parameters

### Monitorable and/or Configurable Parameters for Subsystems Within Each System:

- PLIIM-based object identification subsystem: [ object identity code; object attribute acquisition codes;....]
  - PLIIM Subsystem: [VLD status; power VLD; TIM function; temp.;....]
  - IFD ( Camera) Subsystem: [sensor temp; ....]
  - Image Processing Subsystem (Computer): [processor load history; system up time; # of frames (pgs); barcode read rate; current line rate;....]
  - Camera Contact Subsystem (Computer): [number of frames dropped; number of focused zoom commands; number and kinds of motor control errors;....]
- RFID-based object identification subsystem: [....]
  - Object identity and attribute data element queuing, handling and processing subsystem: [....]
- LDIP object identification, velocity-measurement, and dimensioning subsystem: [....]
  - Object velocity measurement subsystem: [polygon RPM; polygon laser output X; channel X drift; channel X noise; trigger error events; instant lock reference drift; temperature]
  - Object H/W/L profiling subsystem
  - Object detection subsystem: [non- singulation/ singulation code;....]
- X-ray scanning subsystem: [....]
- Neutron-beam scanning subsystem: [....]

FIG. 30C

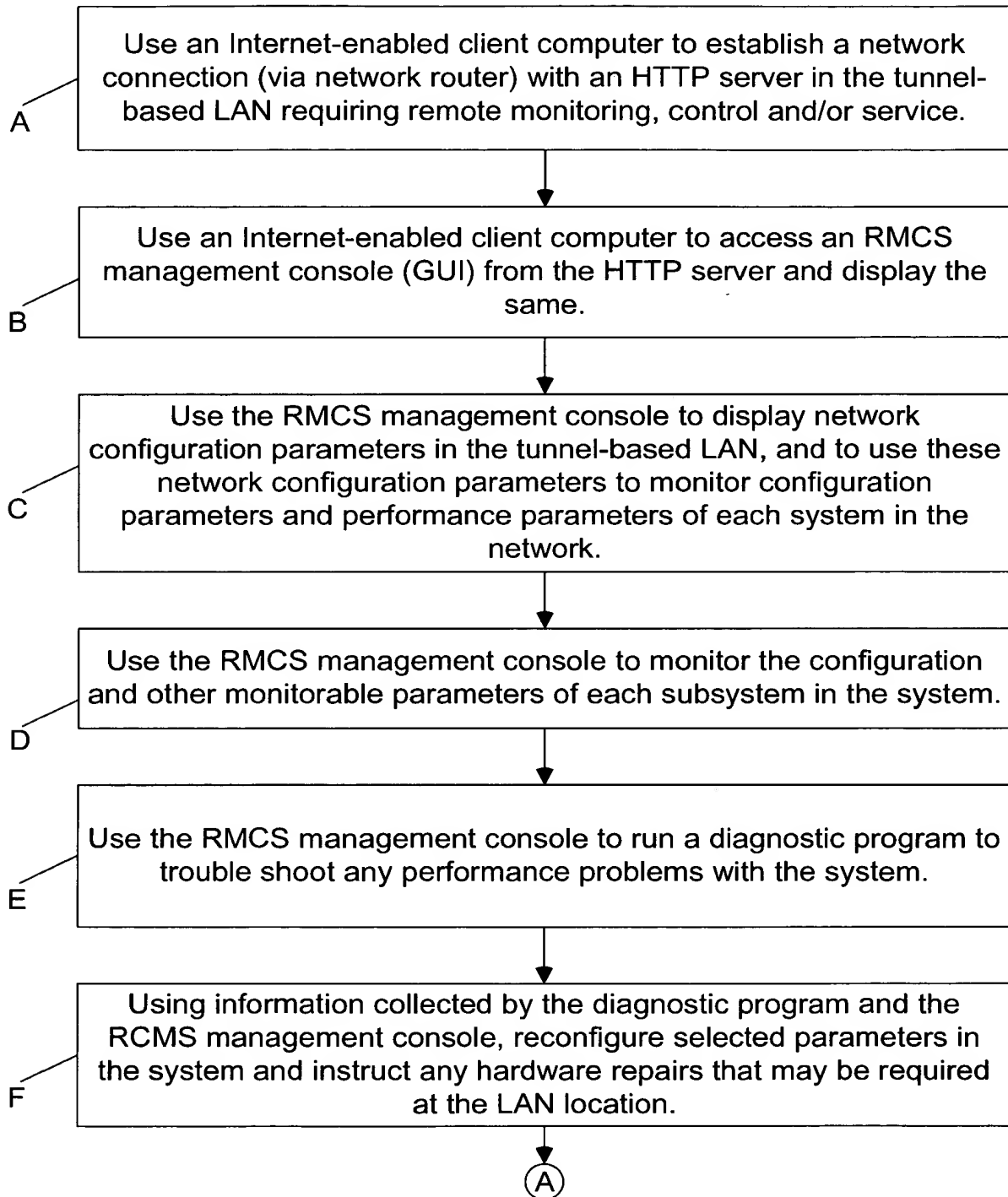


FIG. 30D1

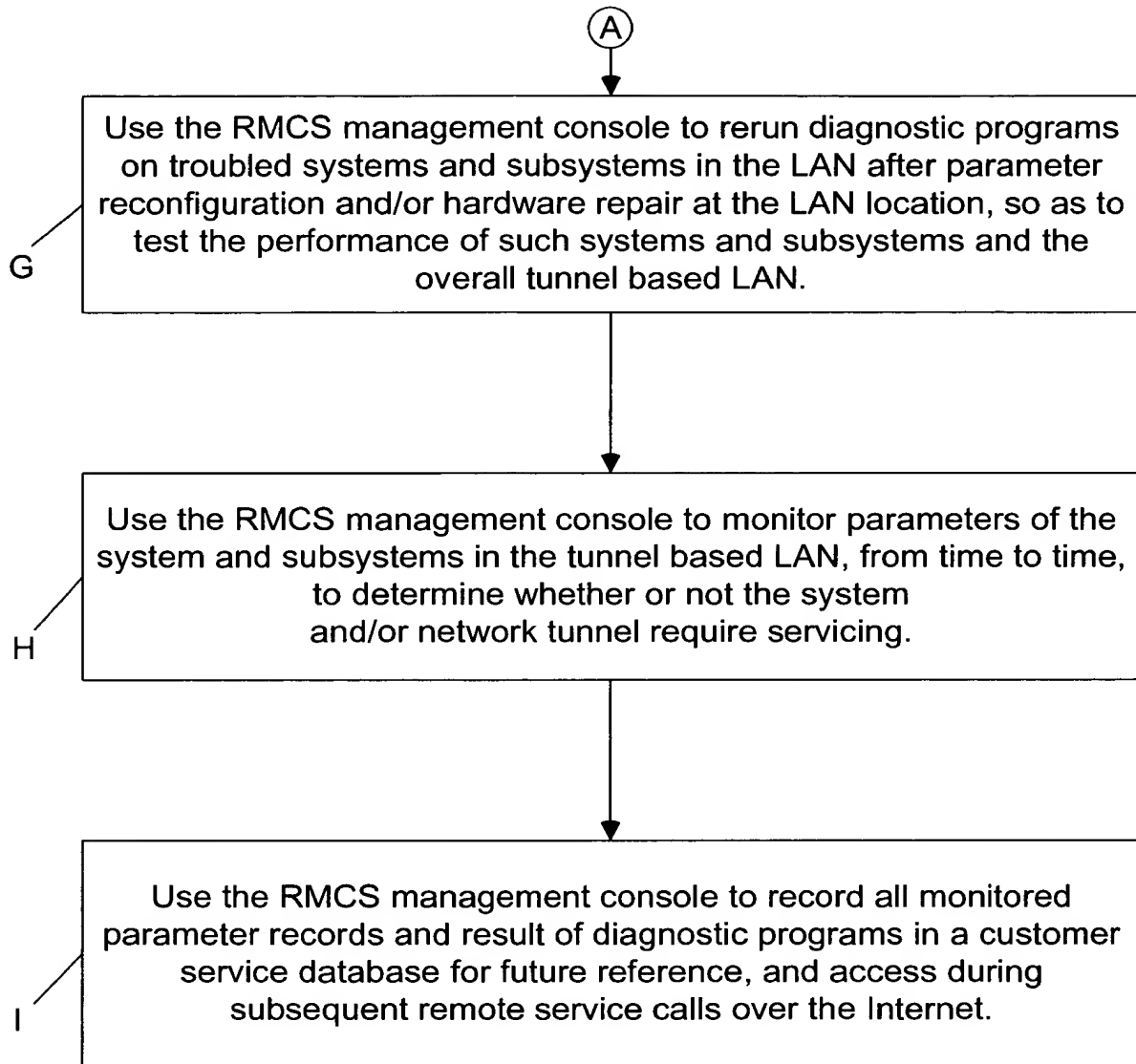


FIG. 30D2

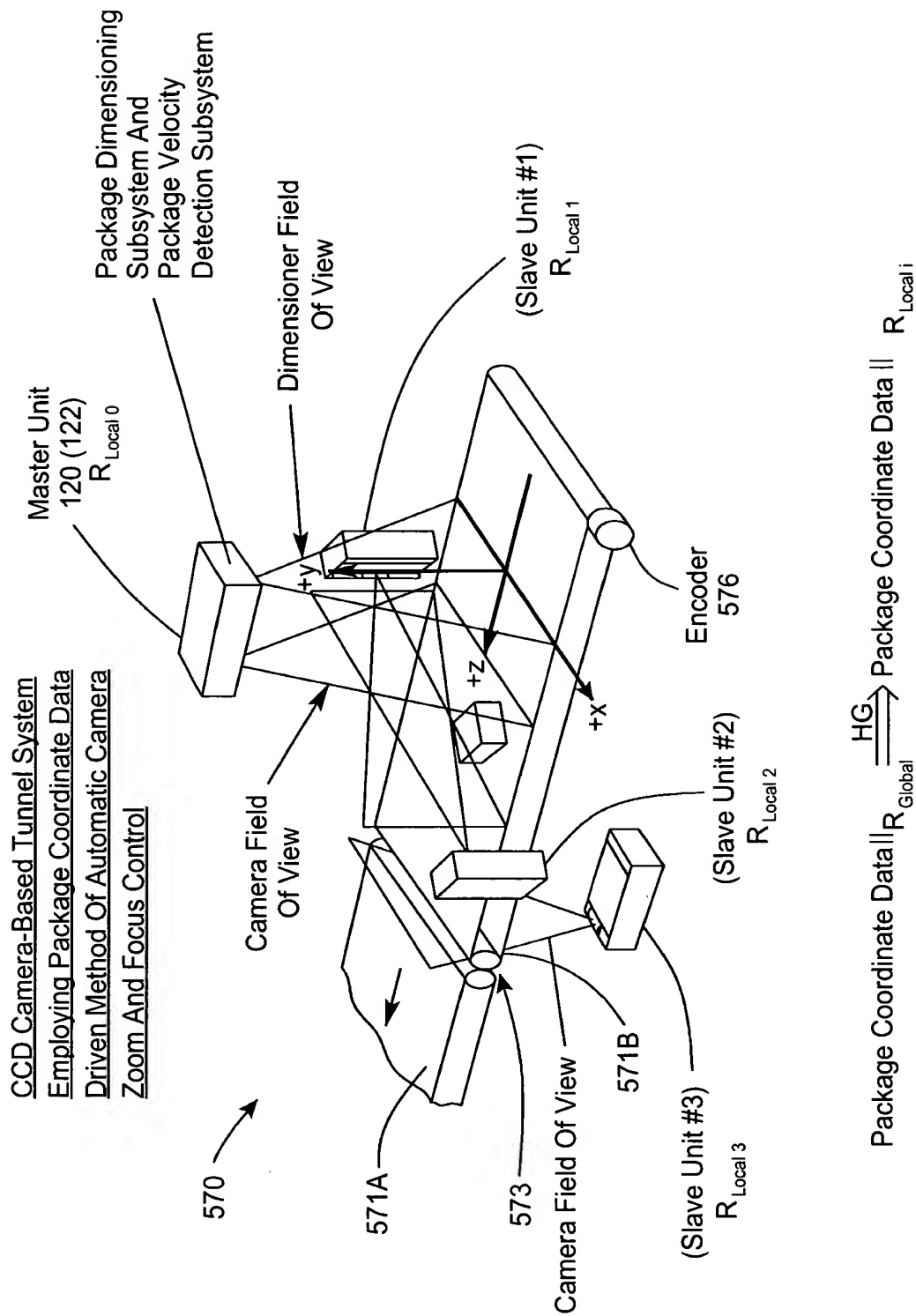


FIG. 31



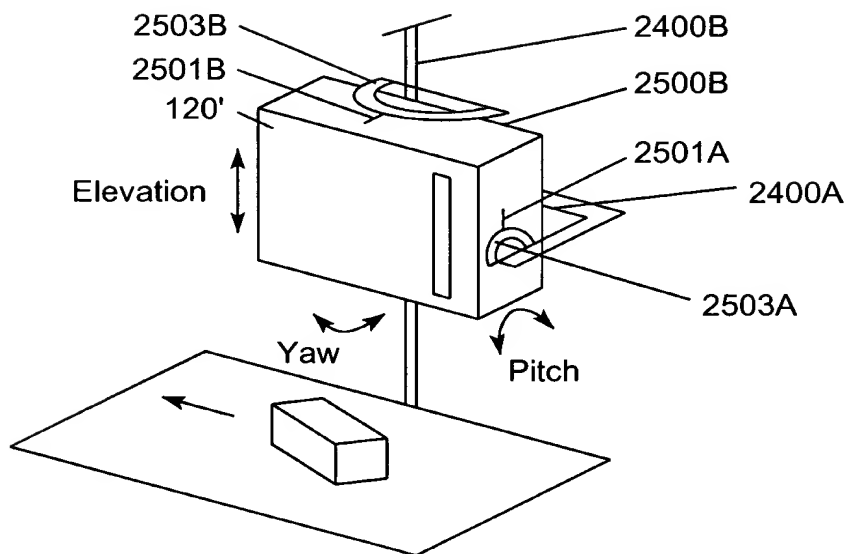


FIG. 31A

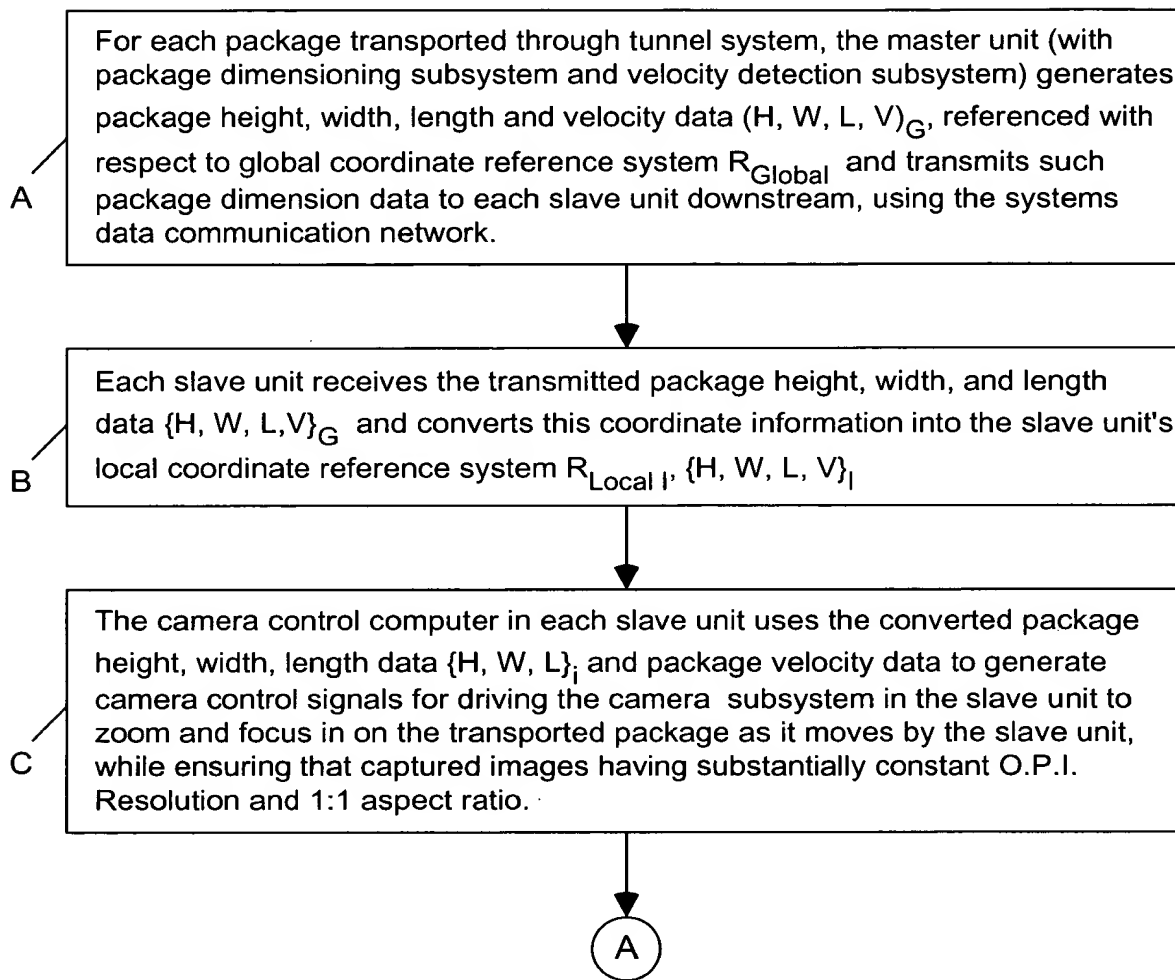


FIG. 32A

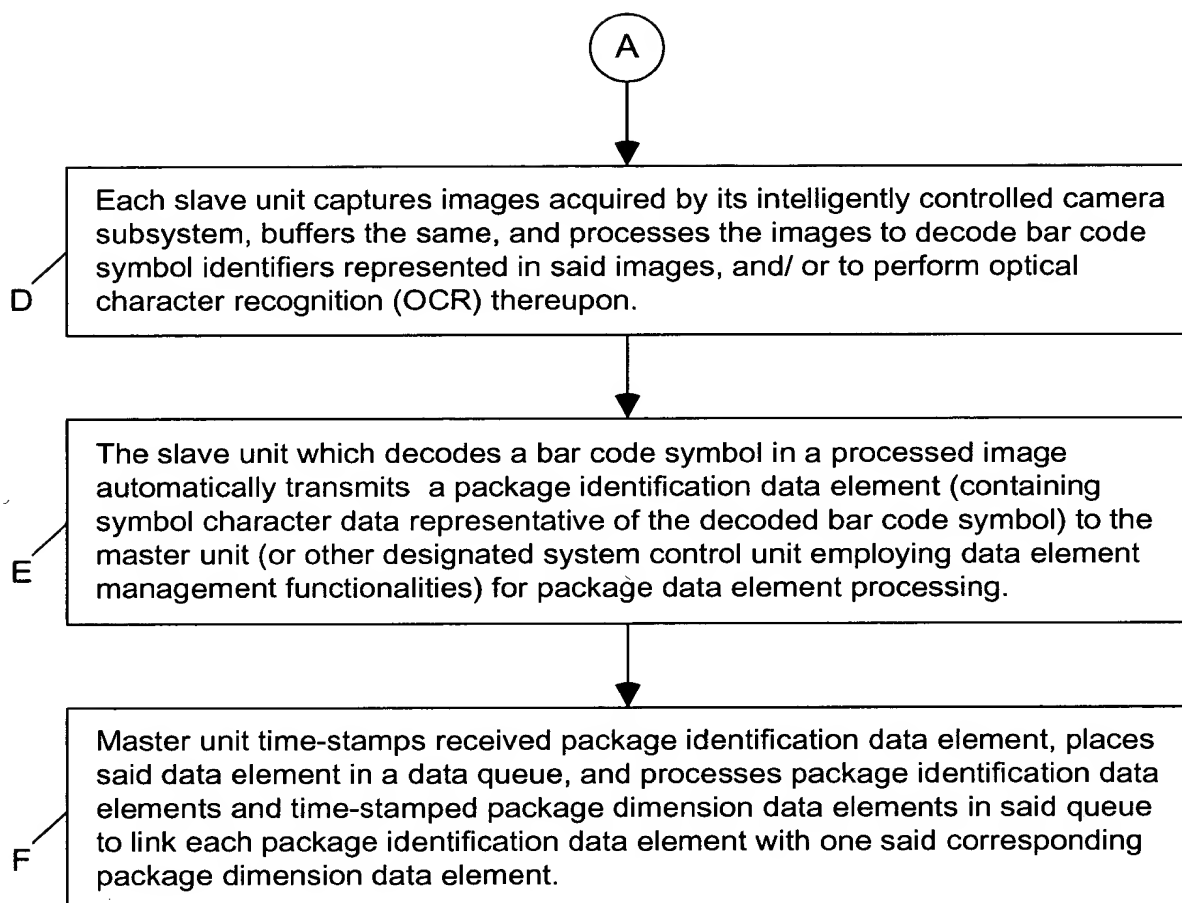


FIG. 32B

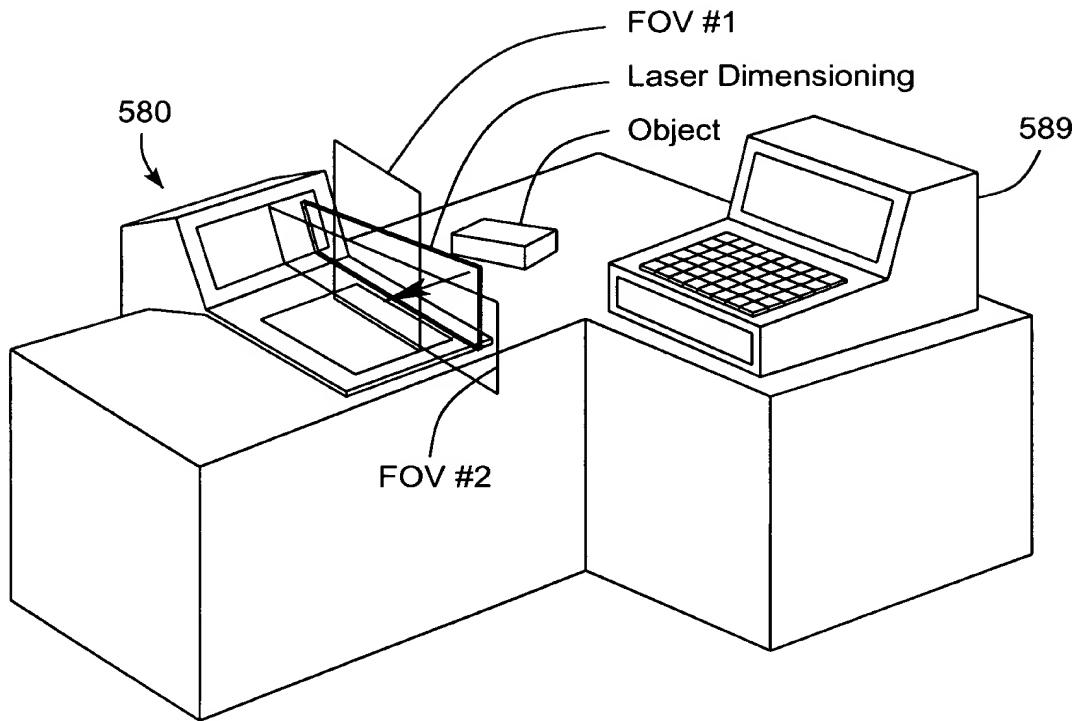


FIG. 33A

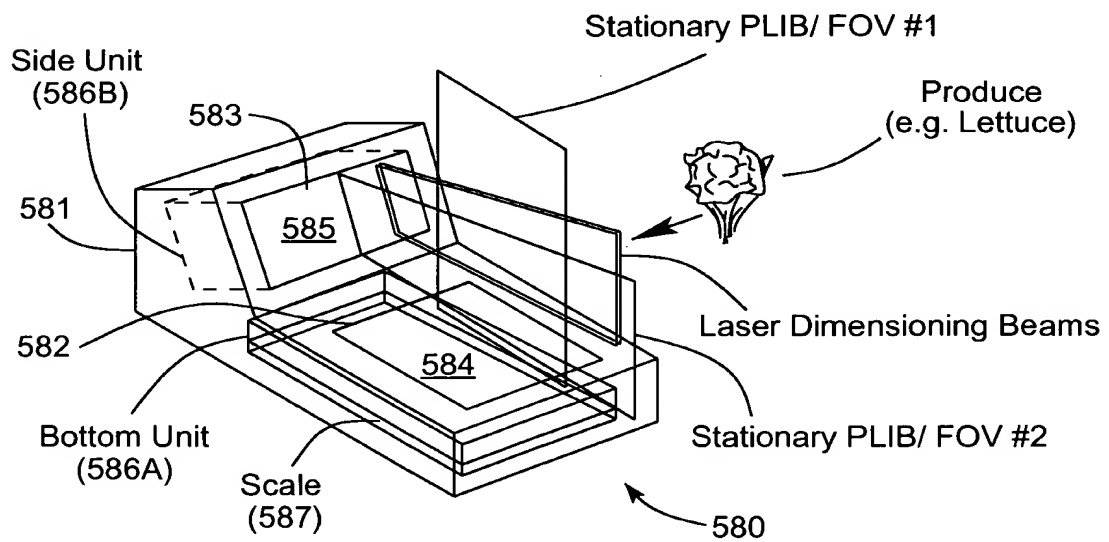


FIG. 33B

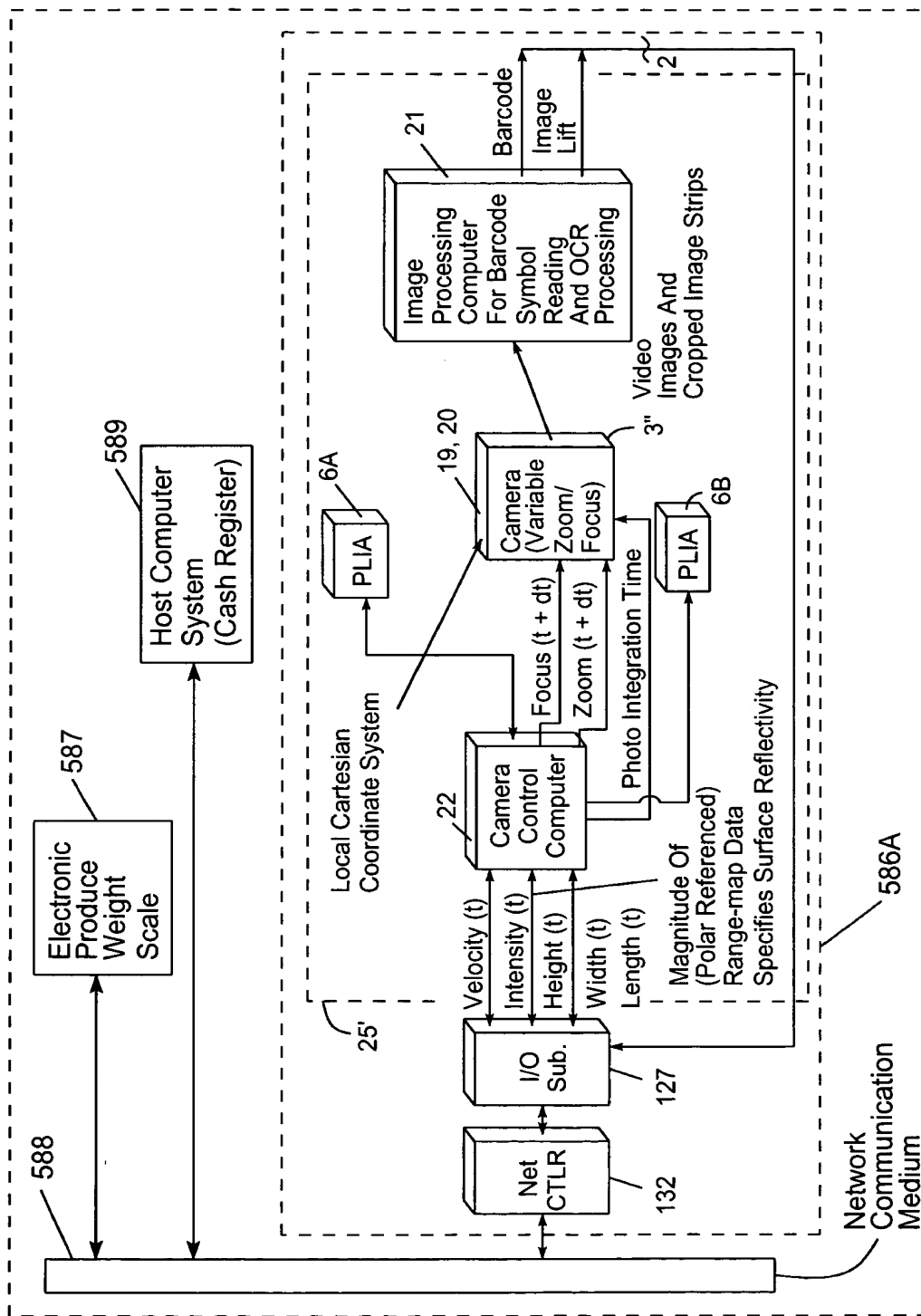
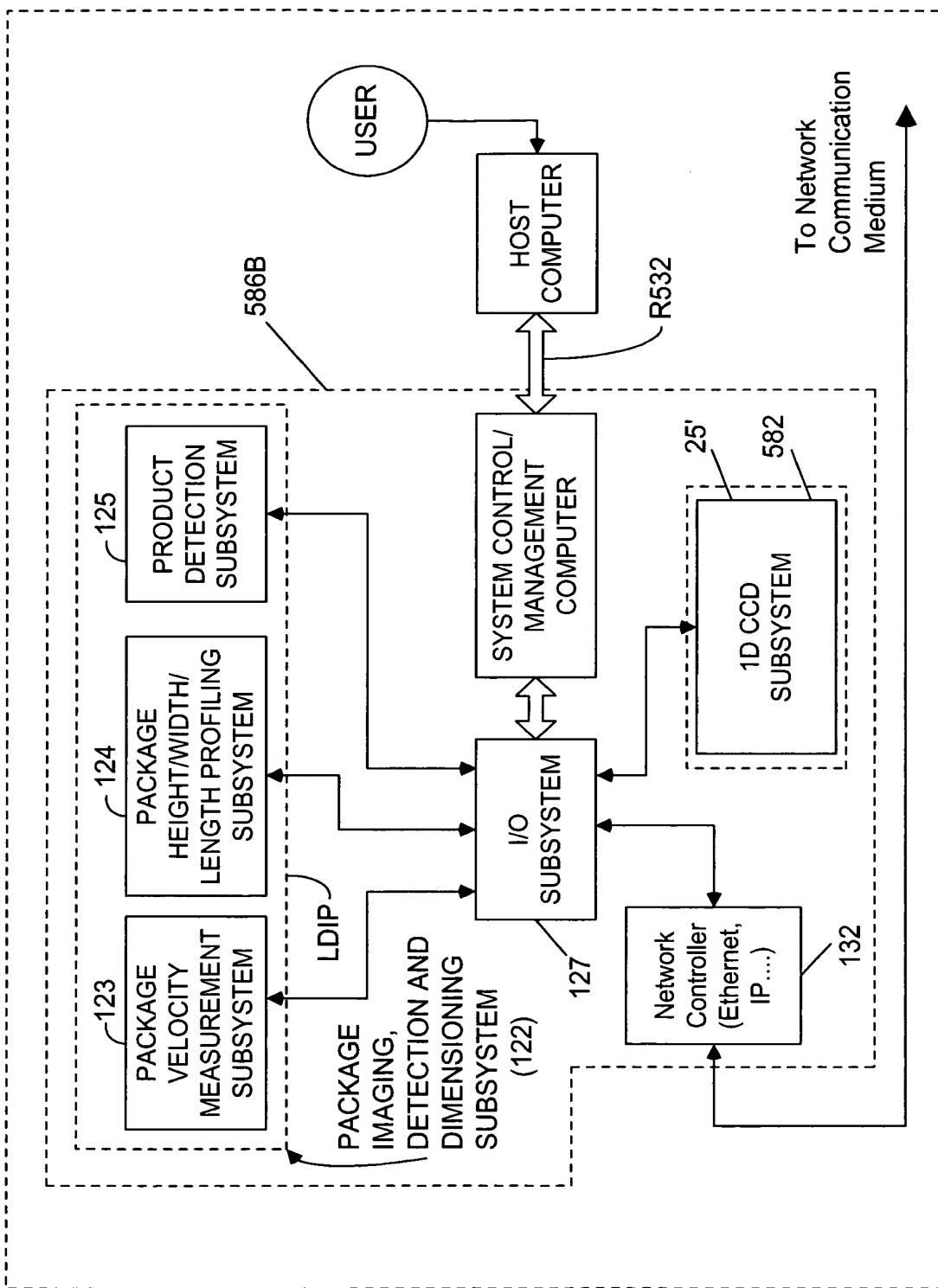


FIG. 33C1



**FIG. 33C2**

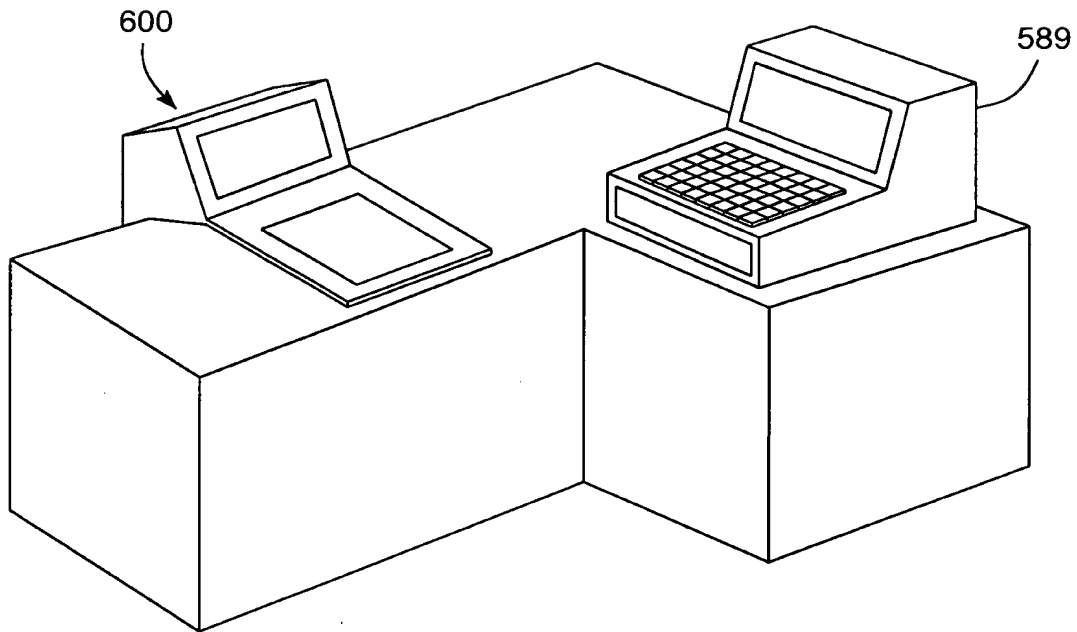


FIG. 34A

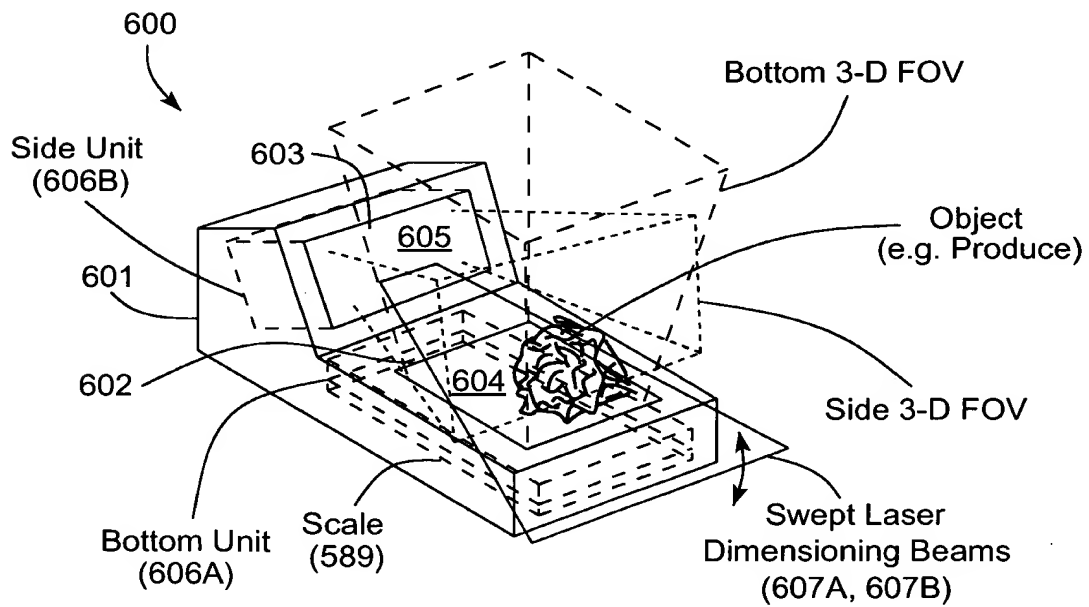


FIG. 34B

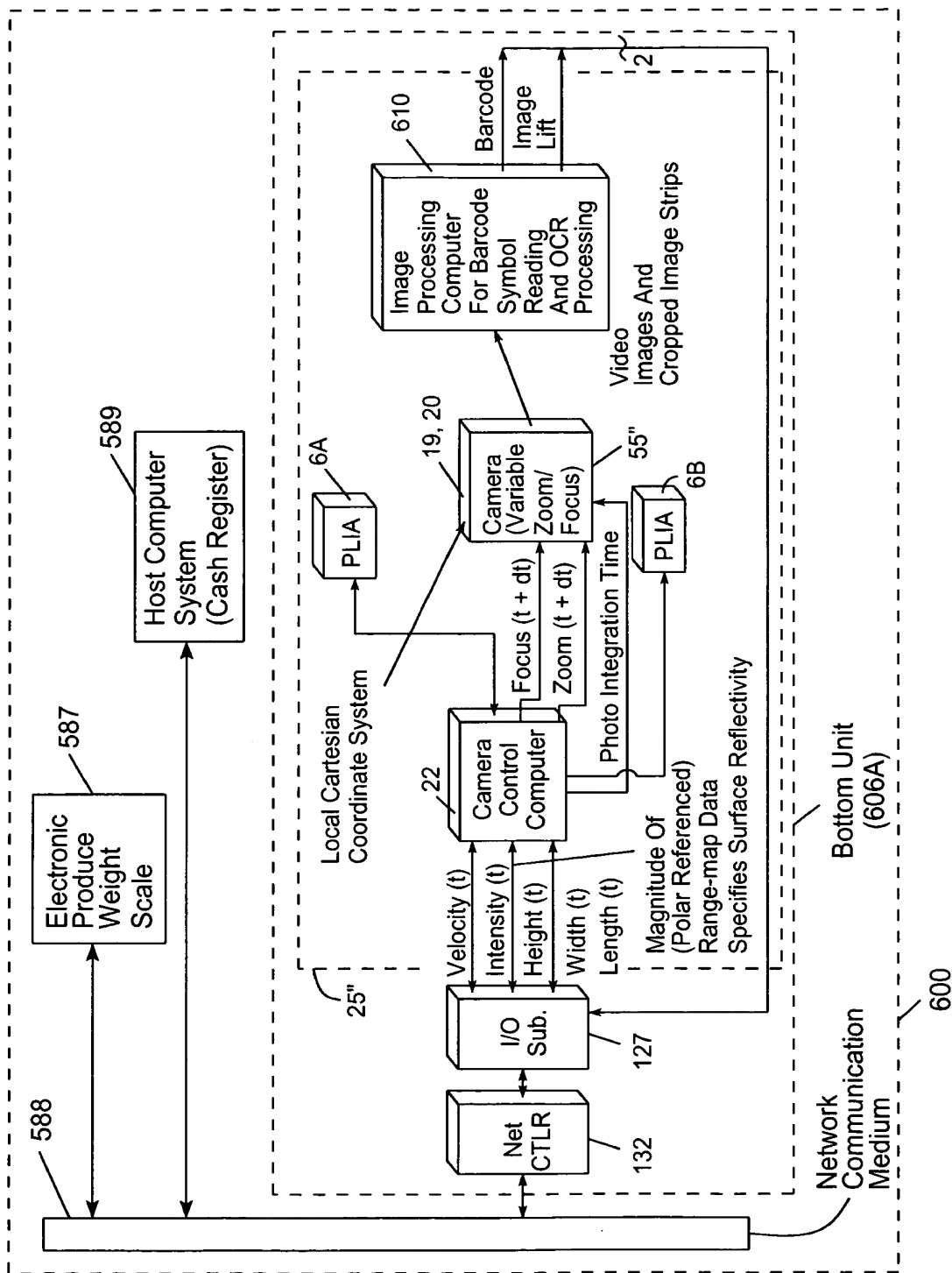


FIG. 34C1



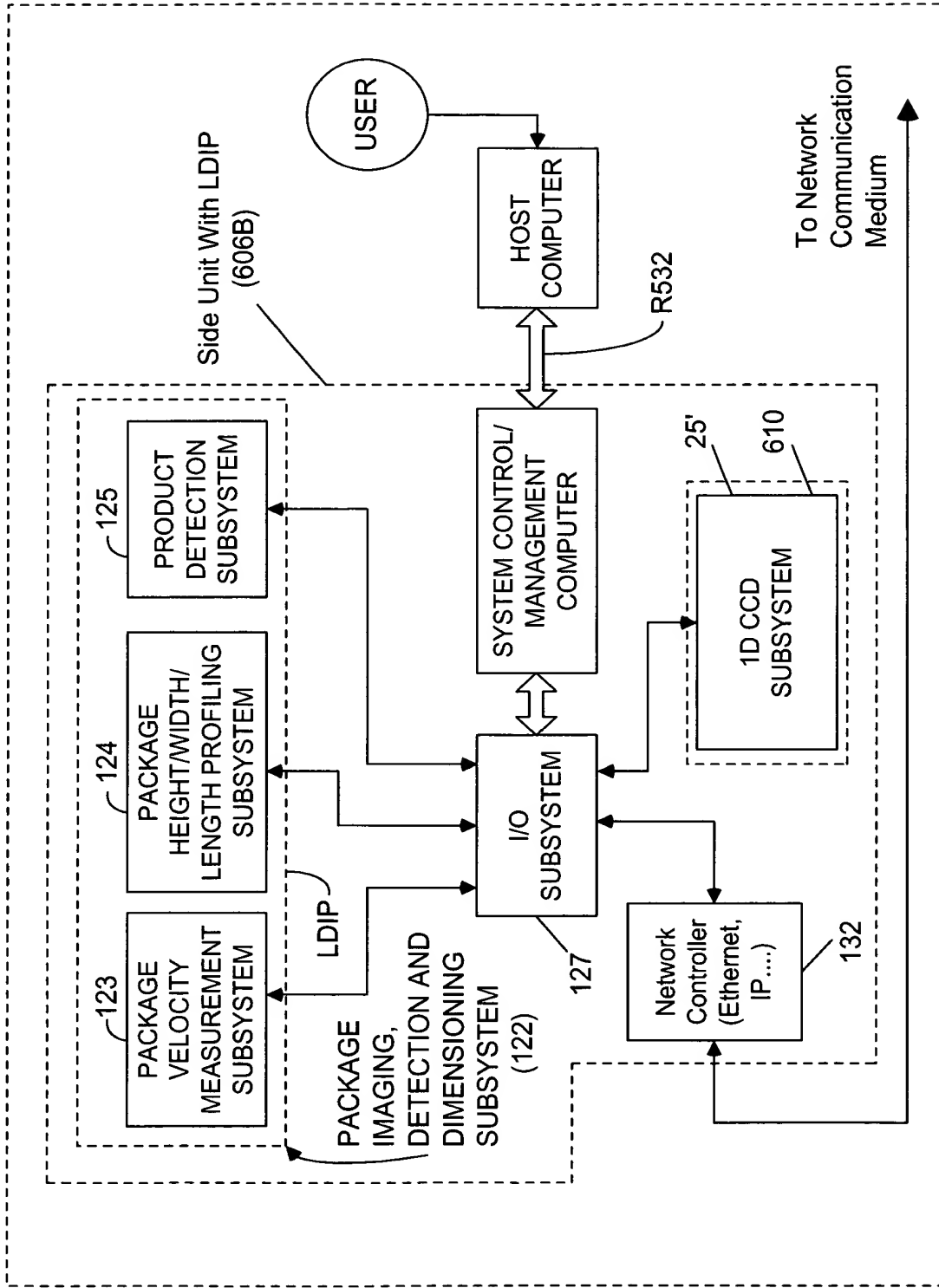


FIG. 34C2

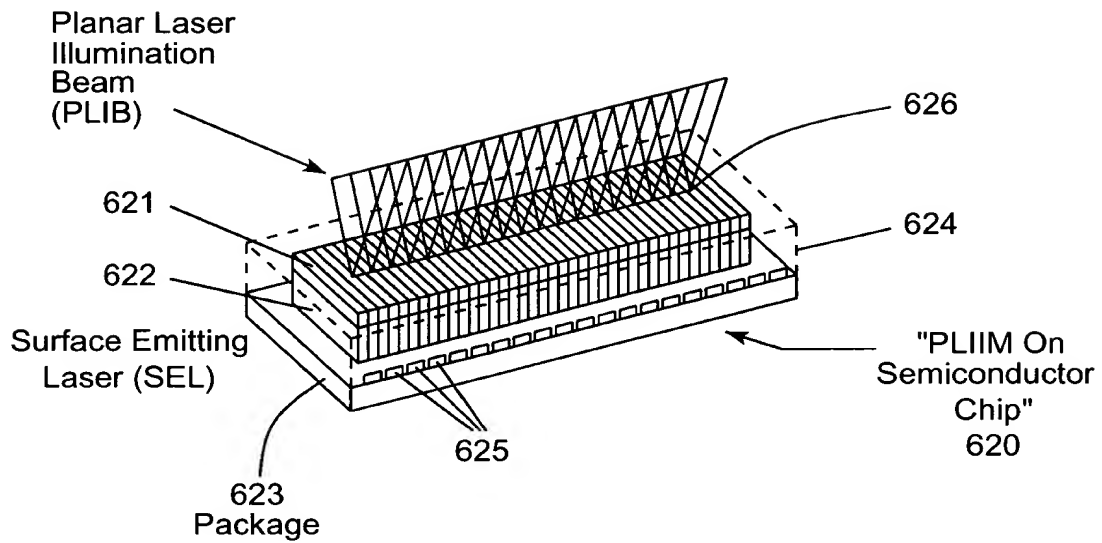


FIG. 35A

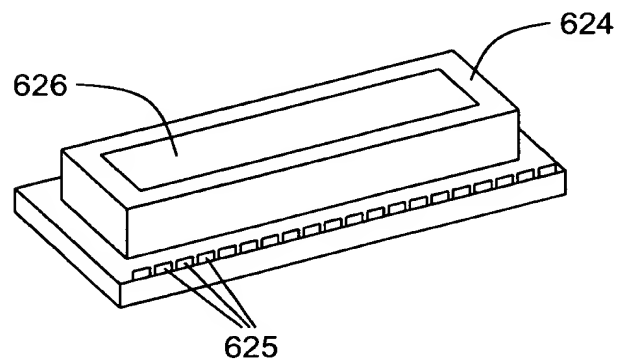
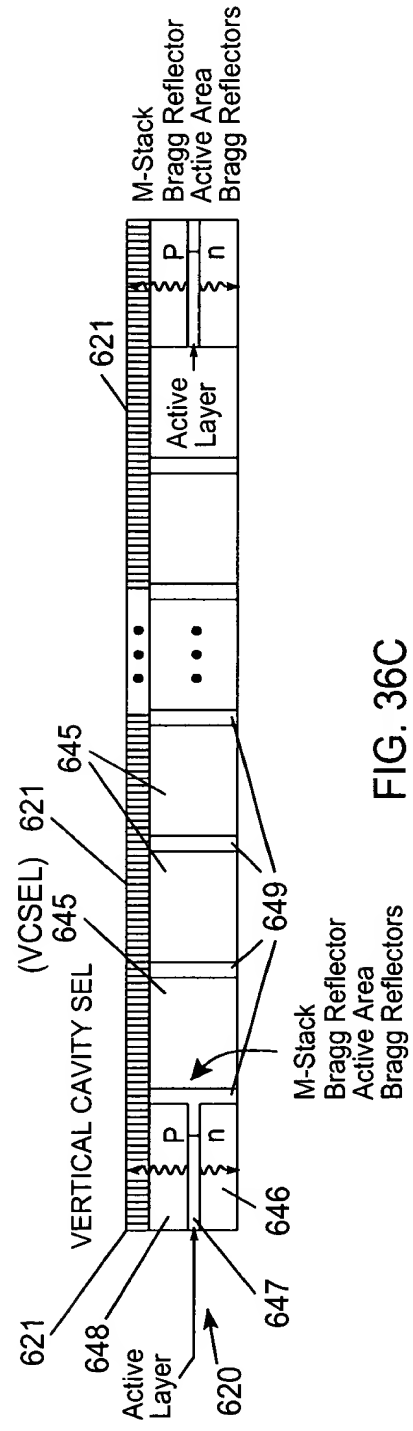


FIG. 35B



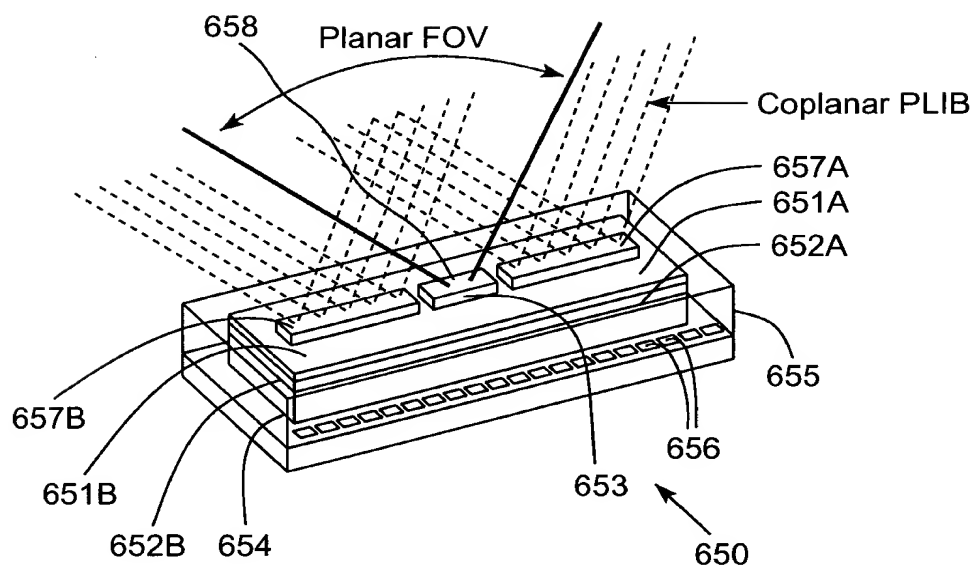


FIG. 37

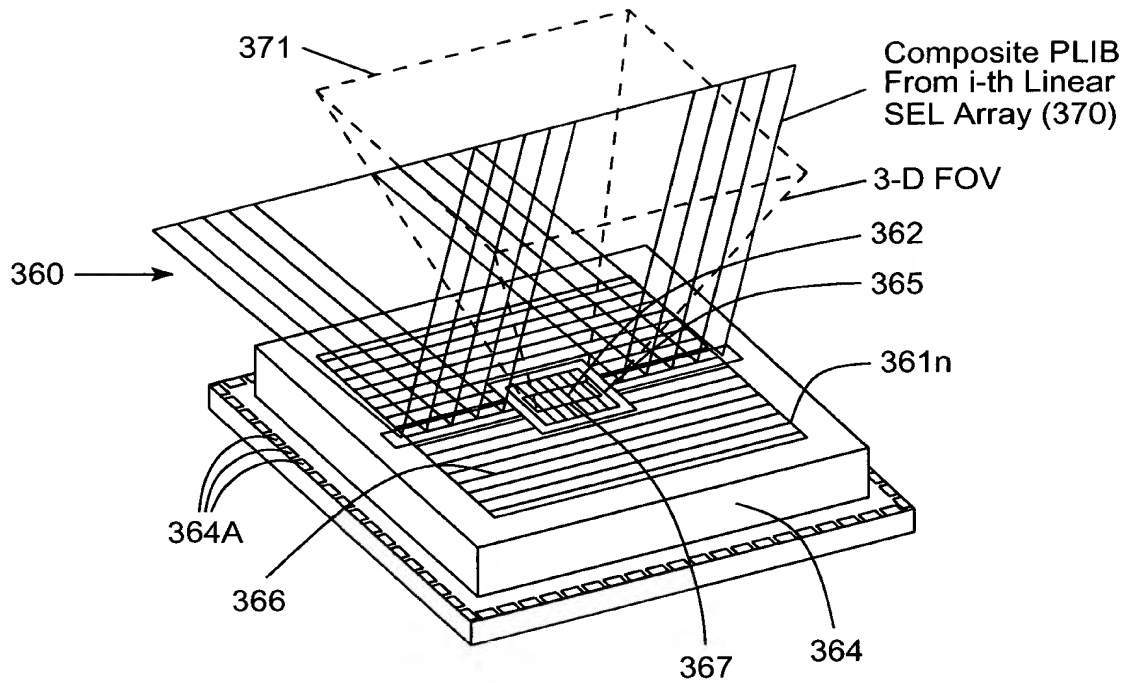


FIG. 38A

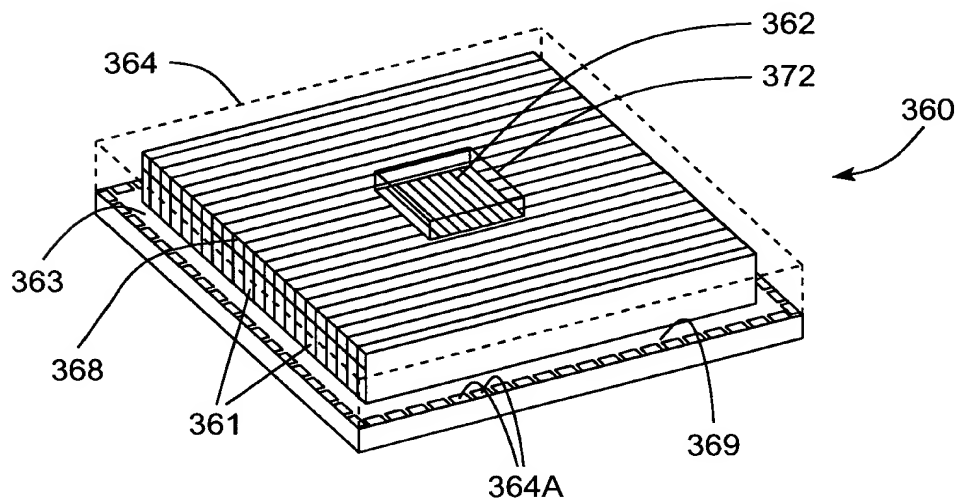


FIG. 38B

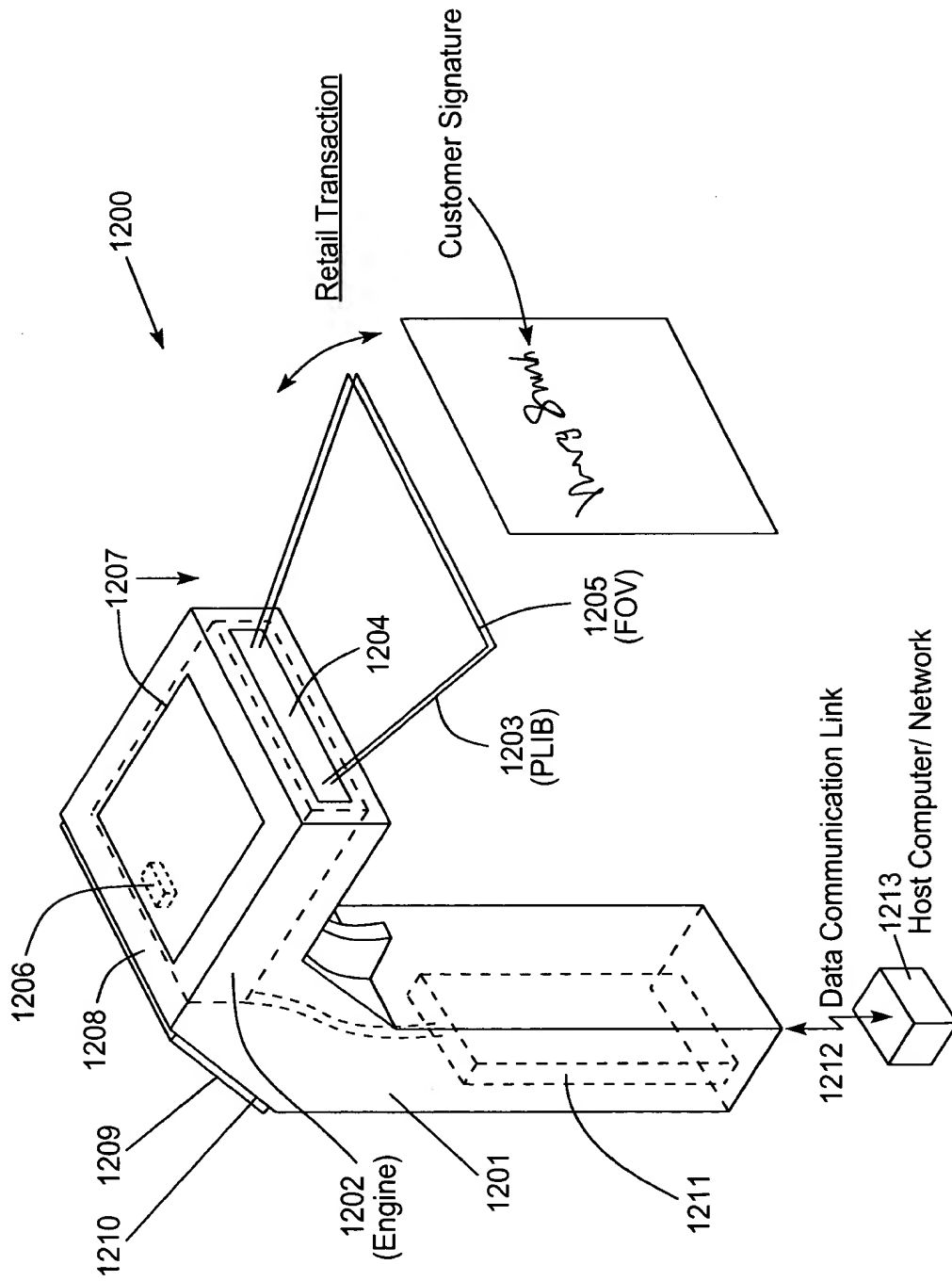


FIG. 39A

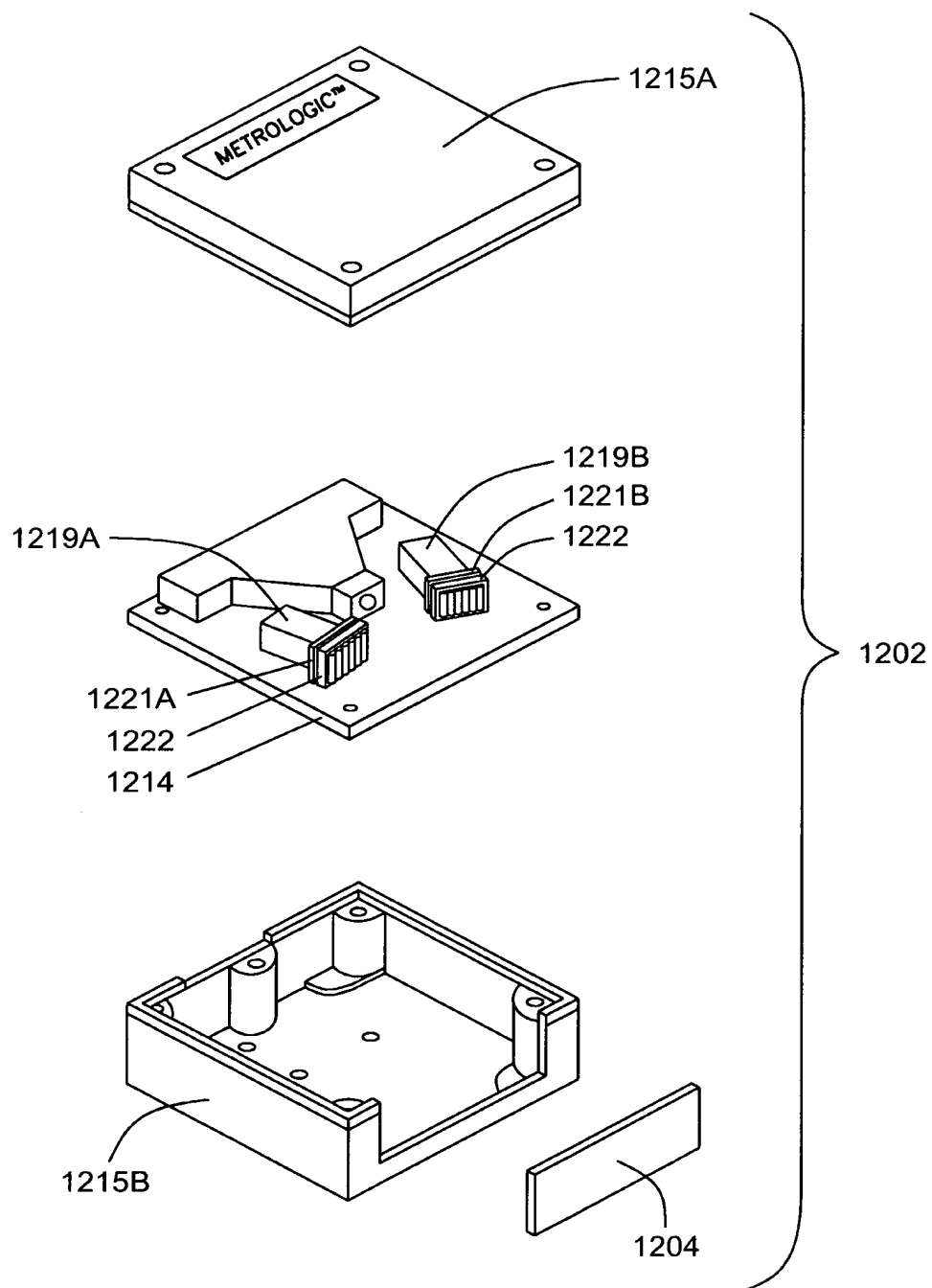


FIG. 39B

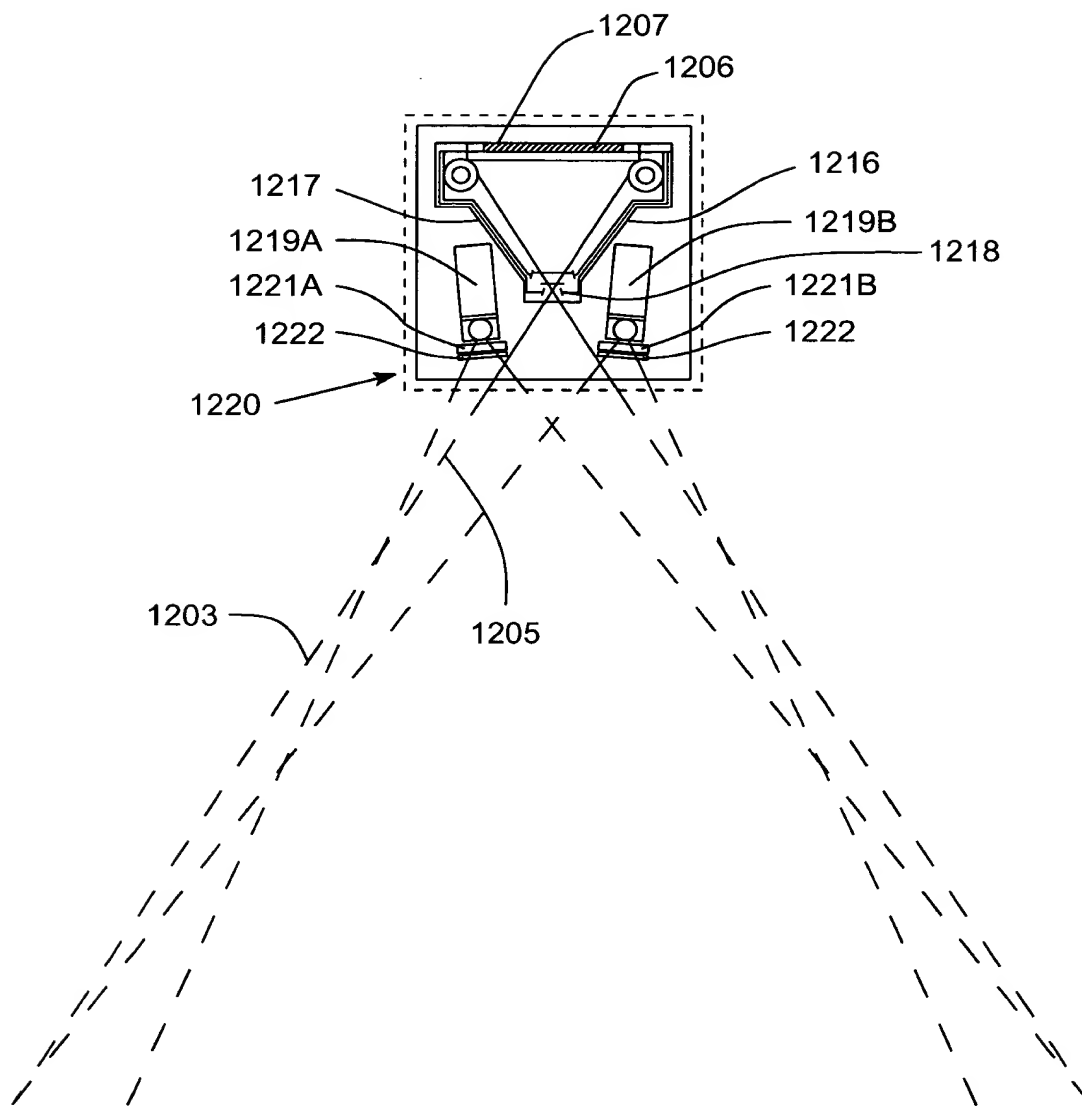


FIG. 39C



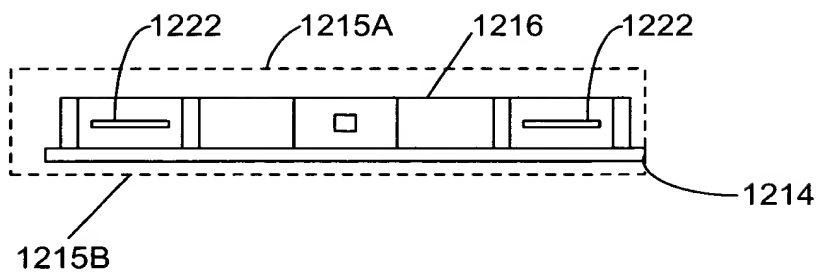


FIG. 39D

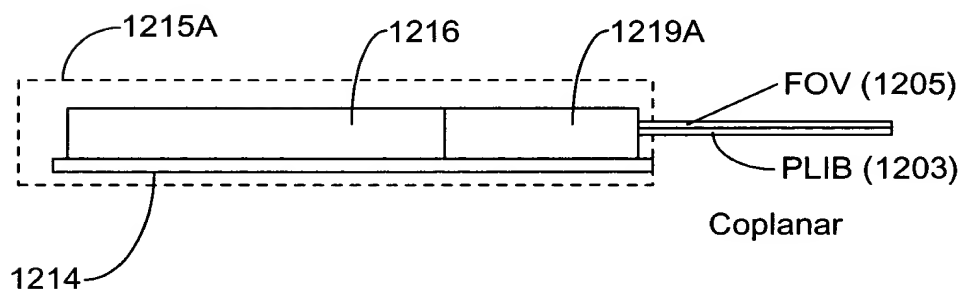


FIG. 39E

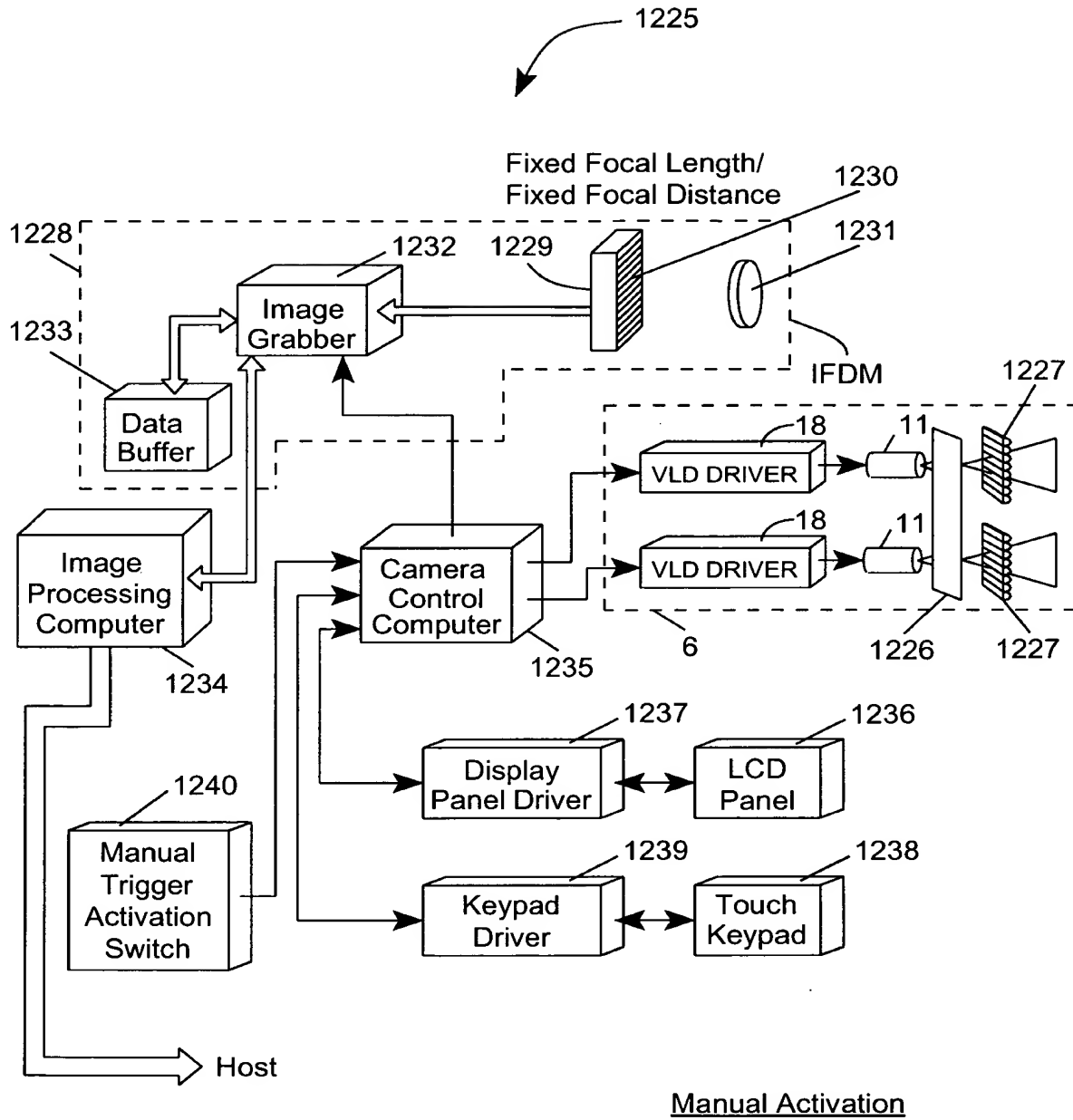
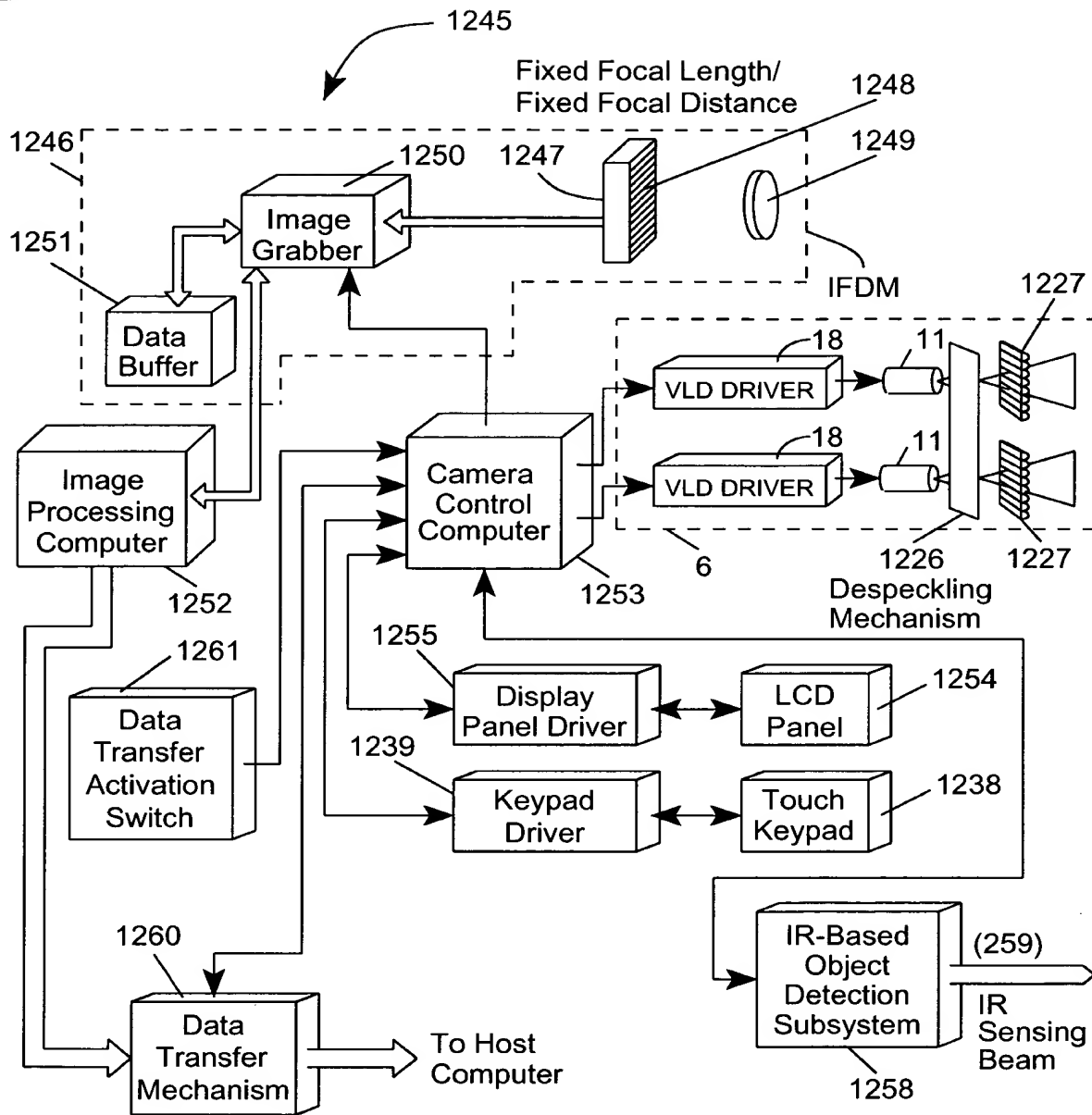
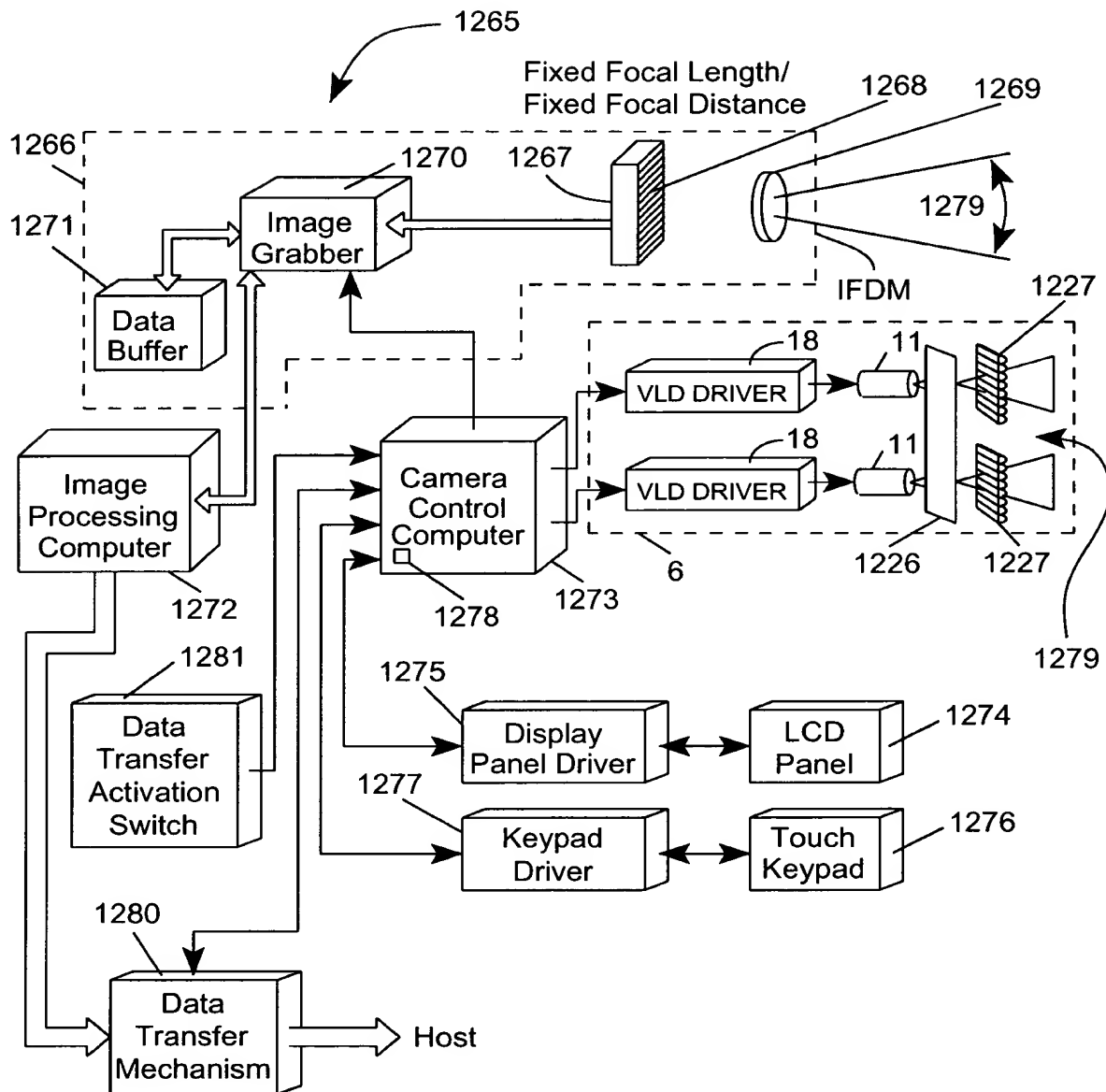


FIG. 40A1



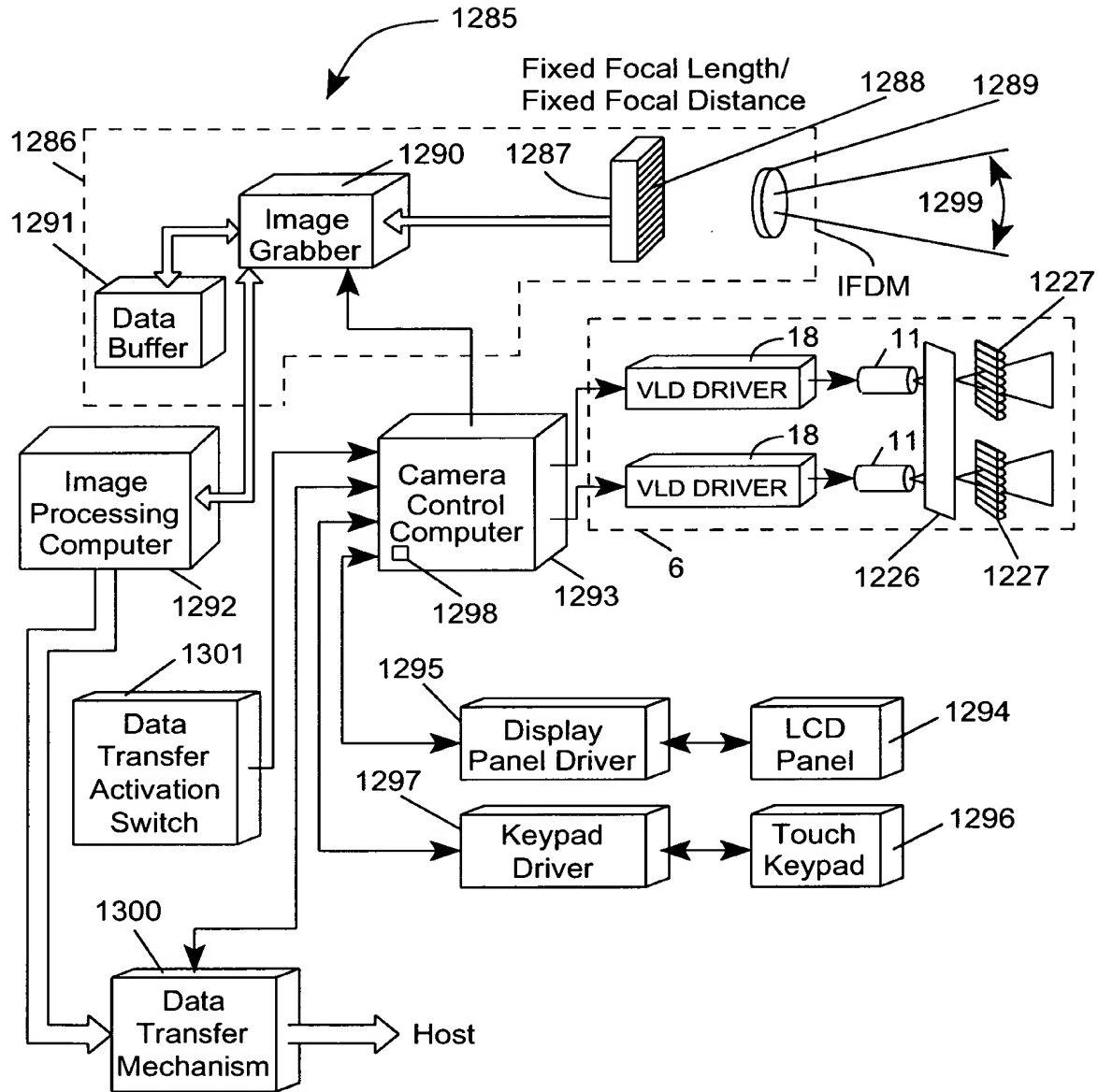
Automatic with IR Object Detection

FIG. 40A2



Automatic with Laser Based Object Detection

FIG. 40A3



Automatic with Passive CCD  
Based Object Detection

FIG. 40A4

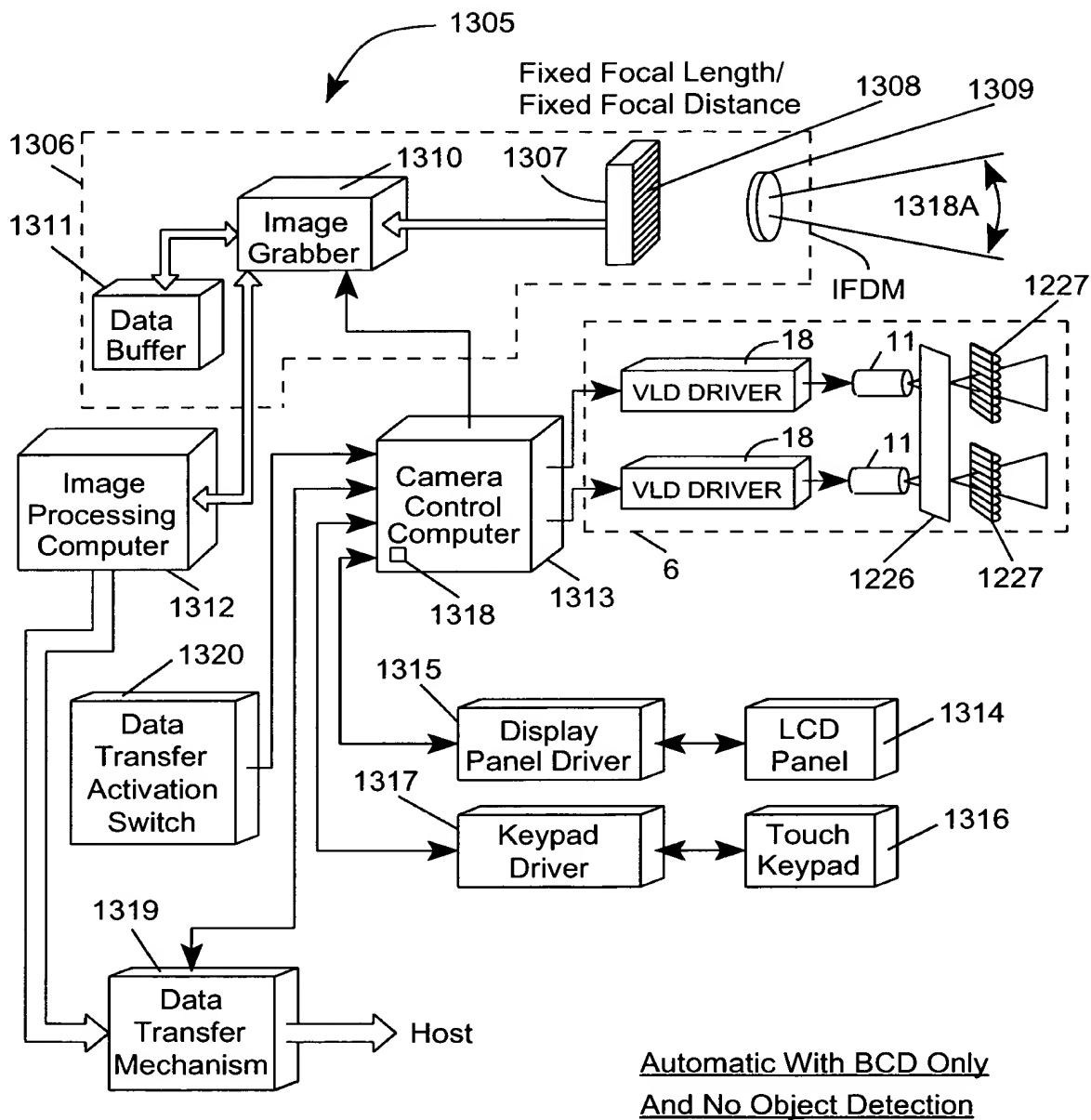


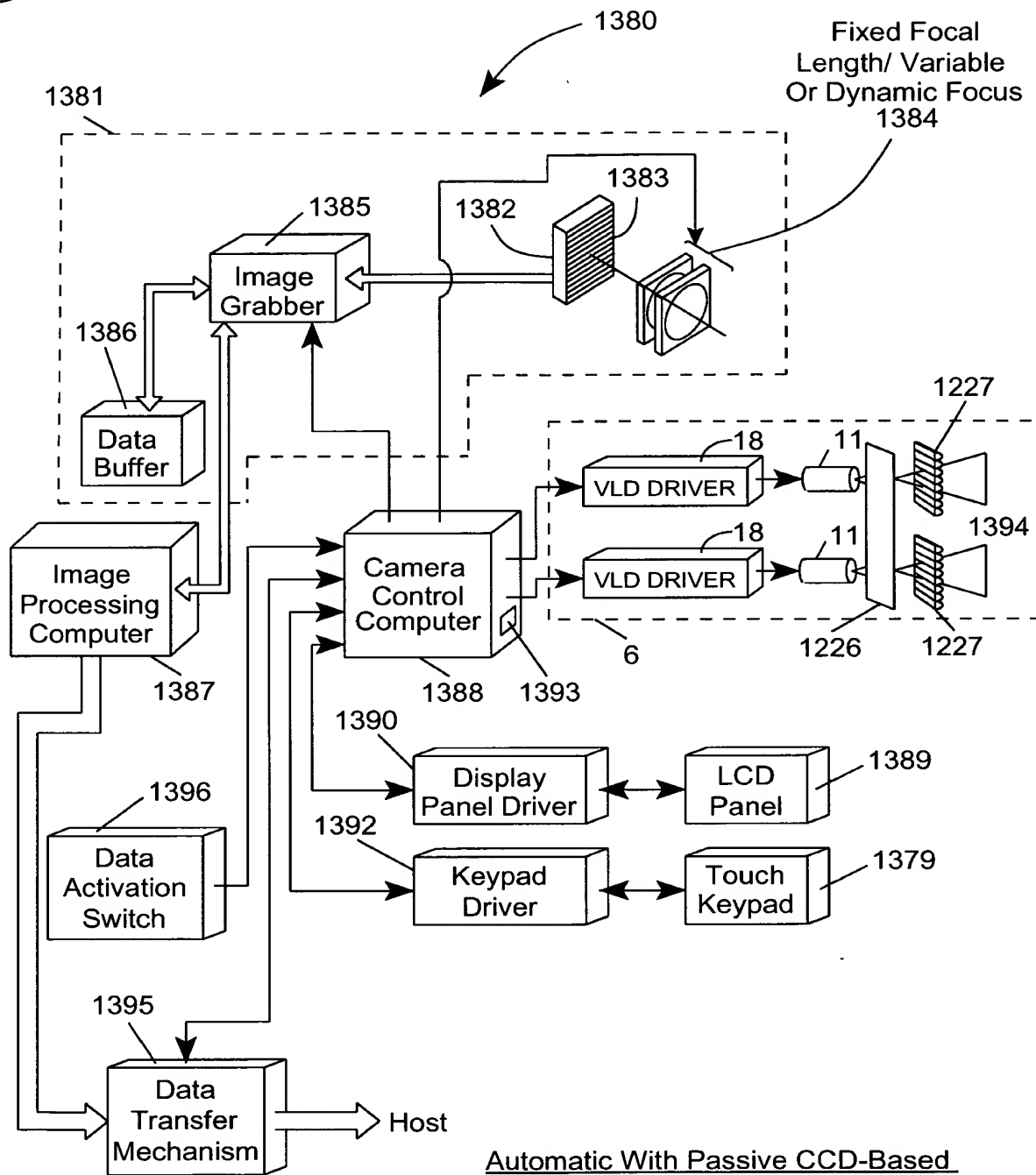
FIG. 40A5











Automatic With Passive CCD-Based  
Object Detection

FIG. 40B4

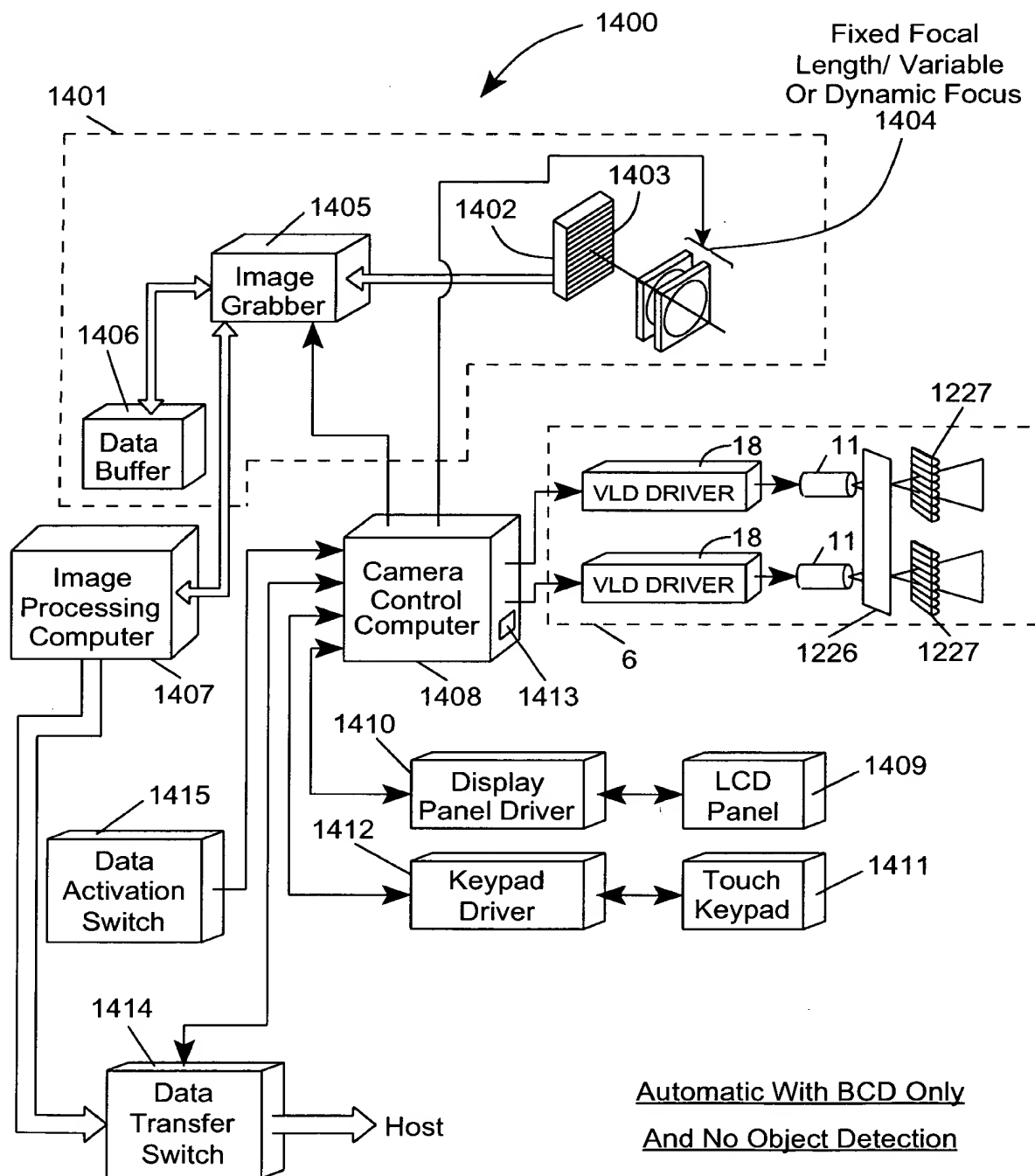


FIG. 40B5

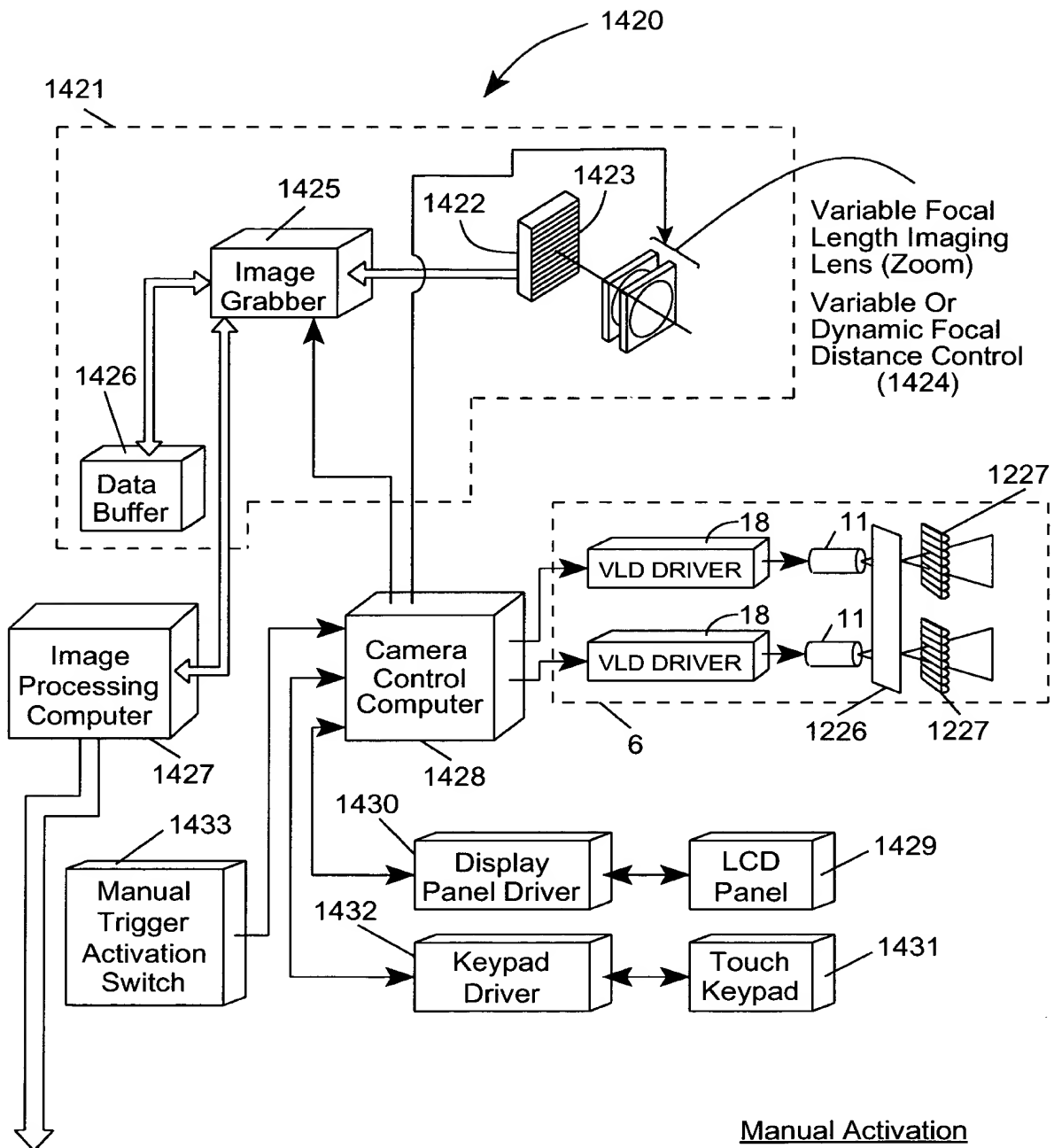


FIG. 40C1



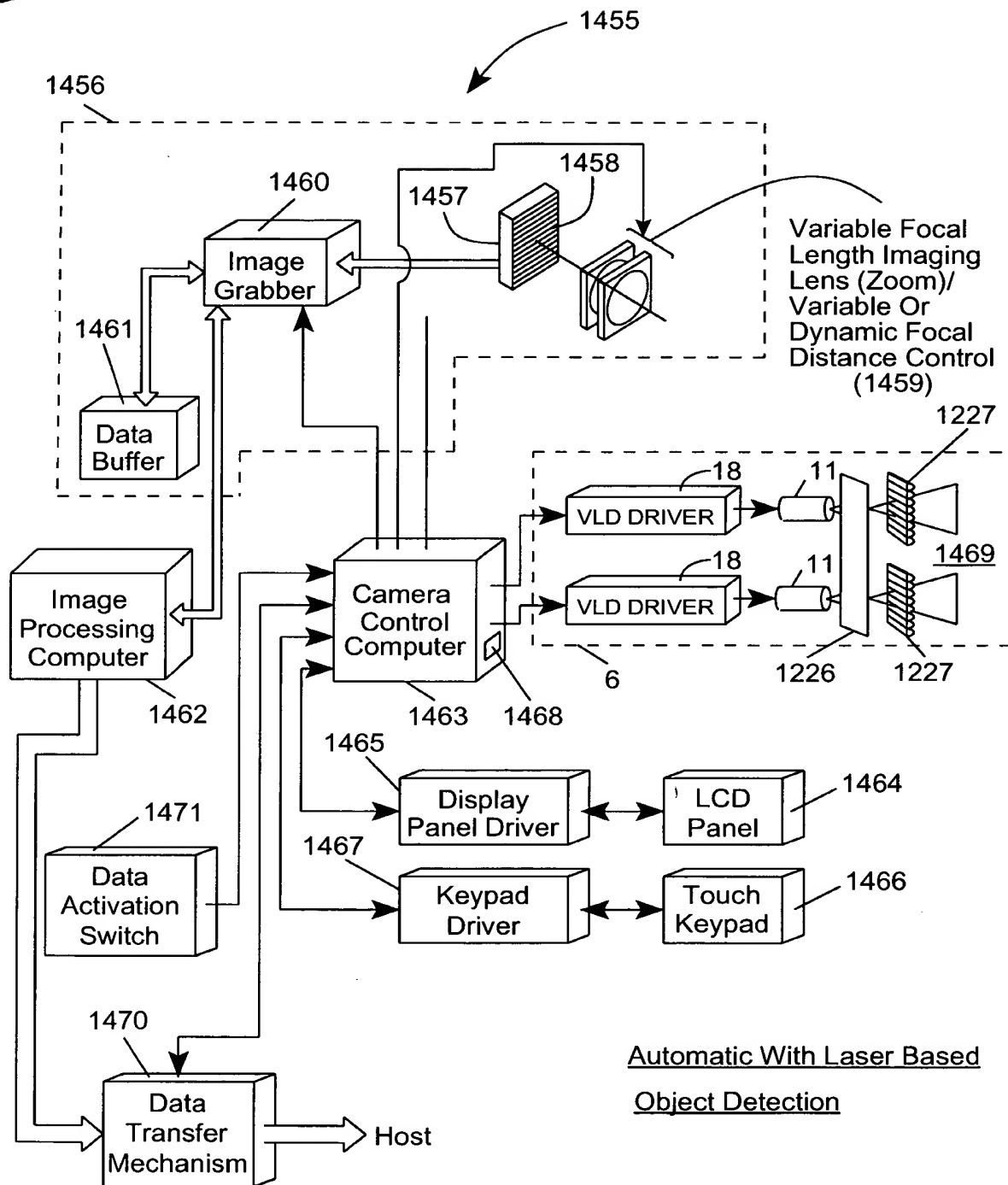


FIG. 40C3

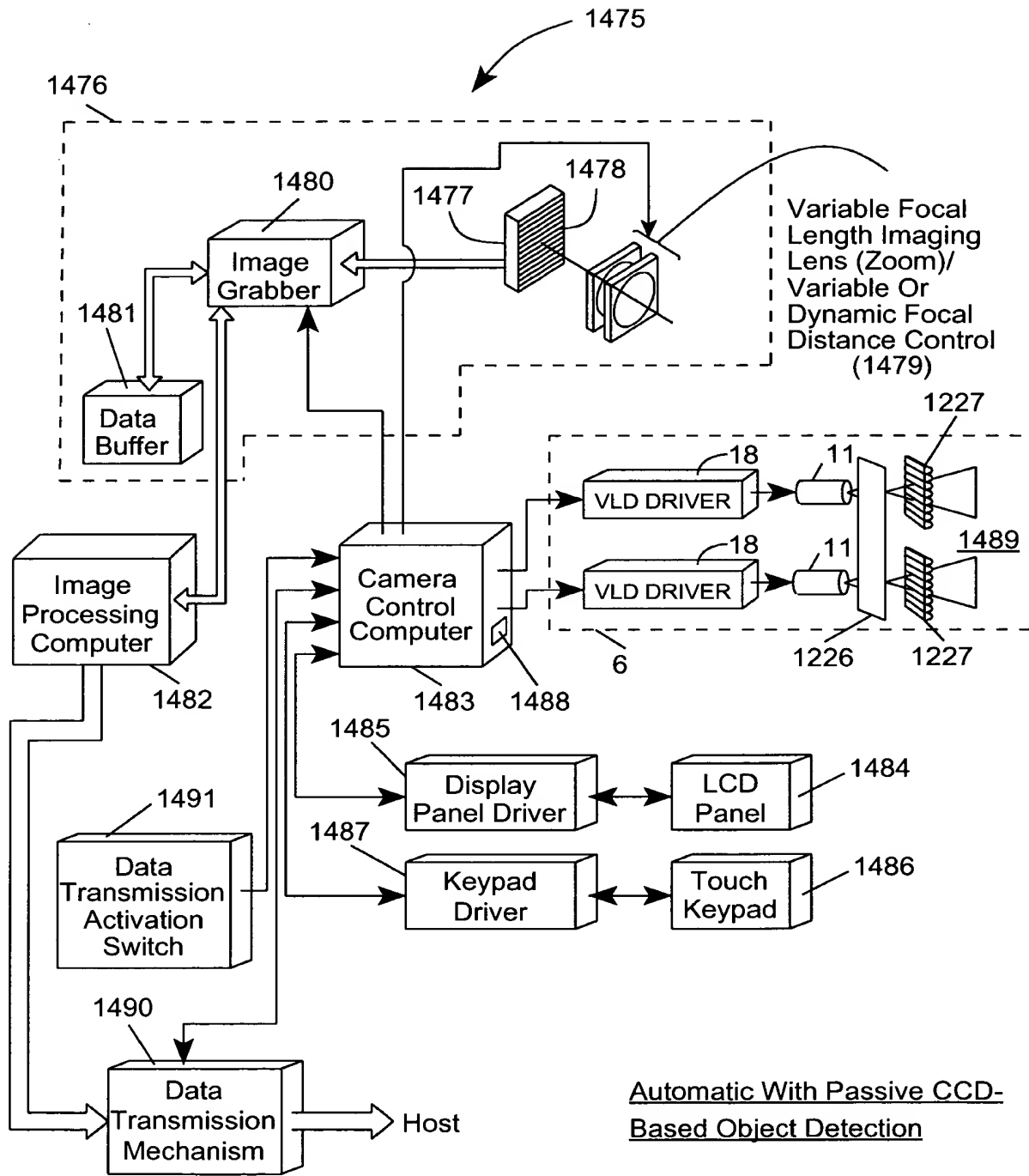


FIG. 40C4

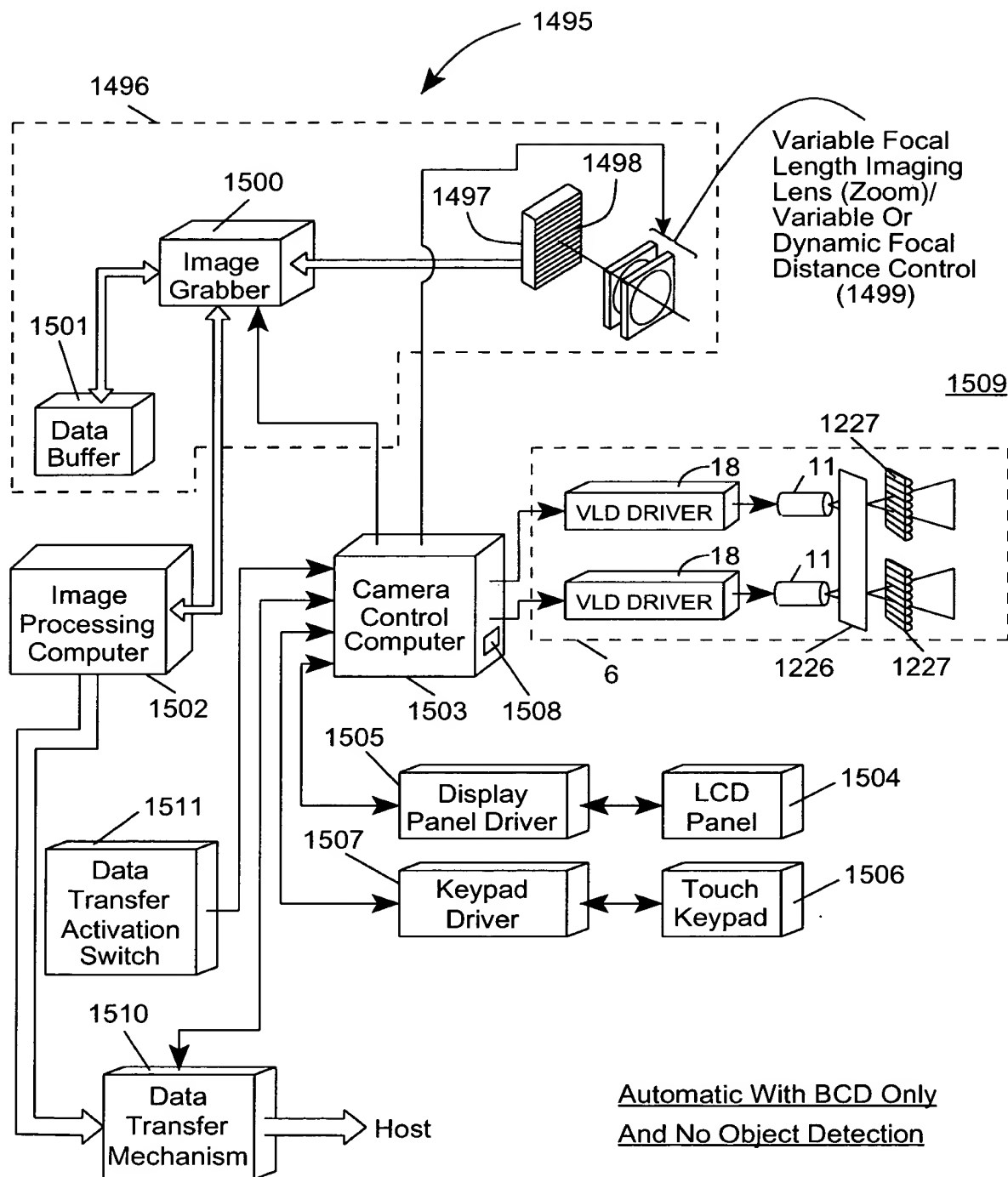


FIG. 40C5



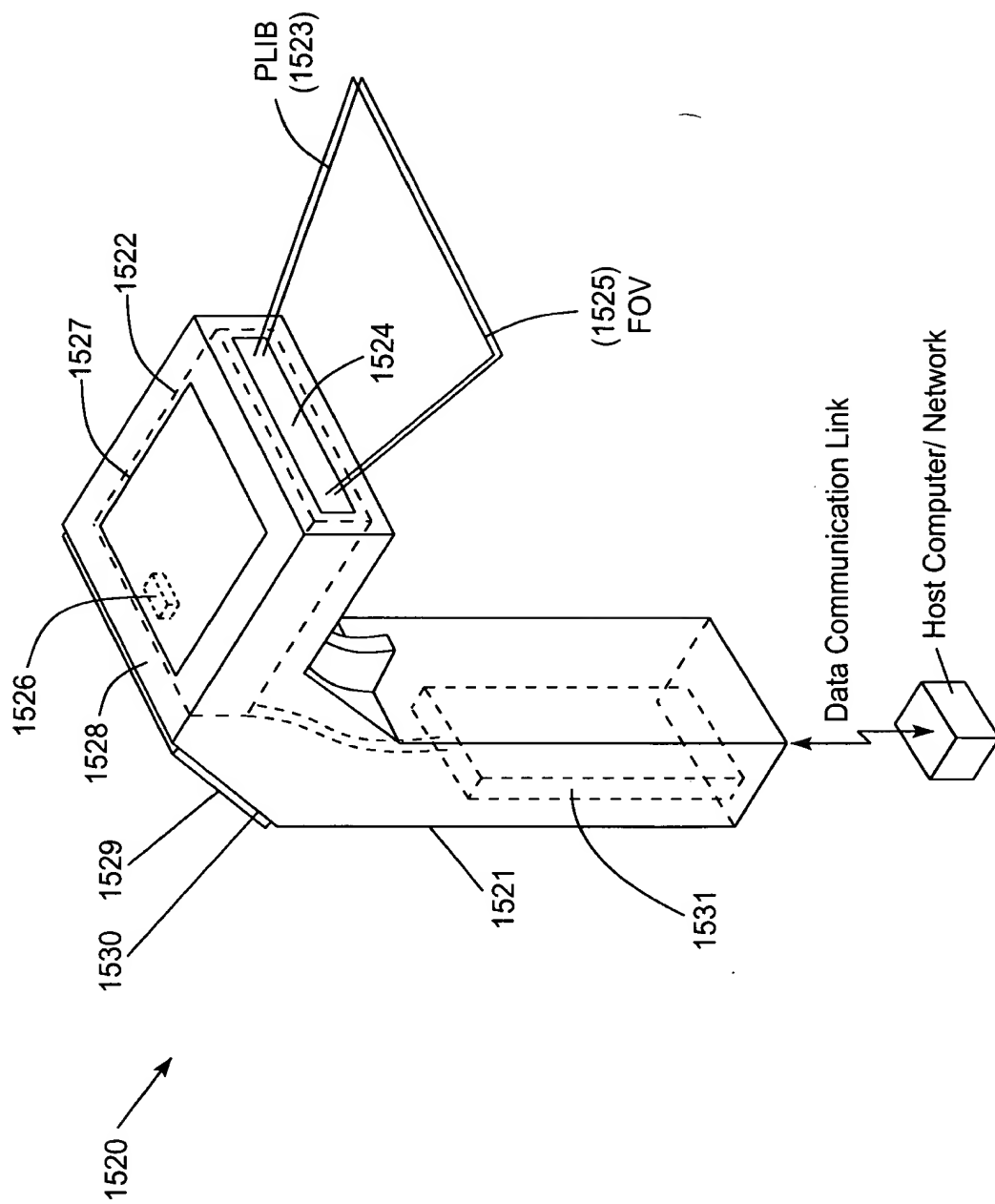


FIG. 41A

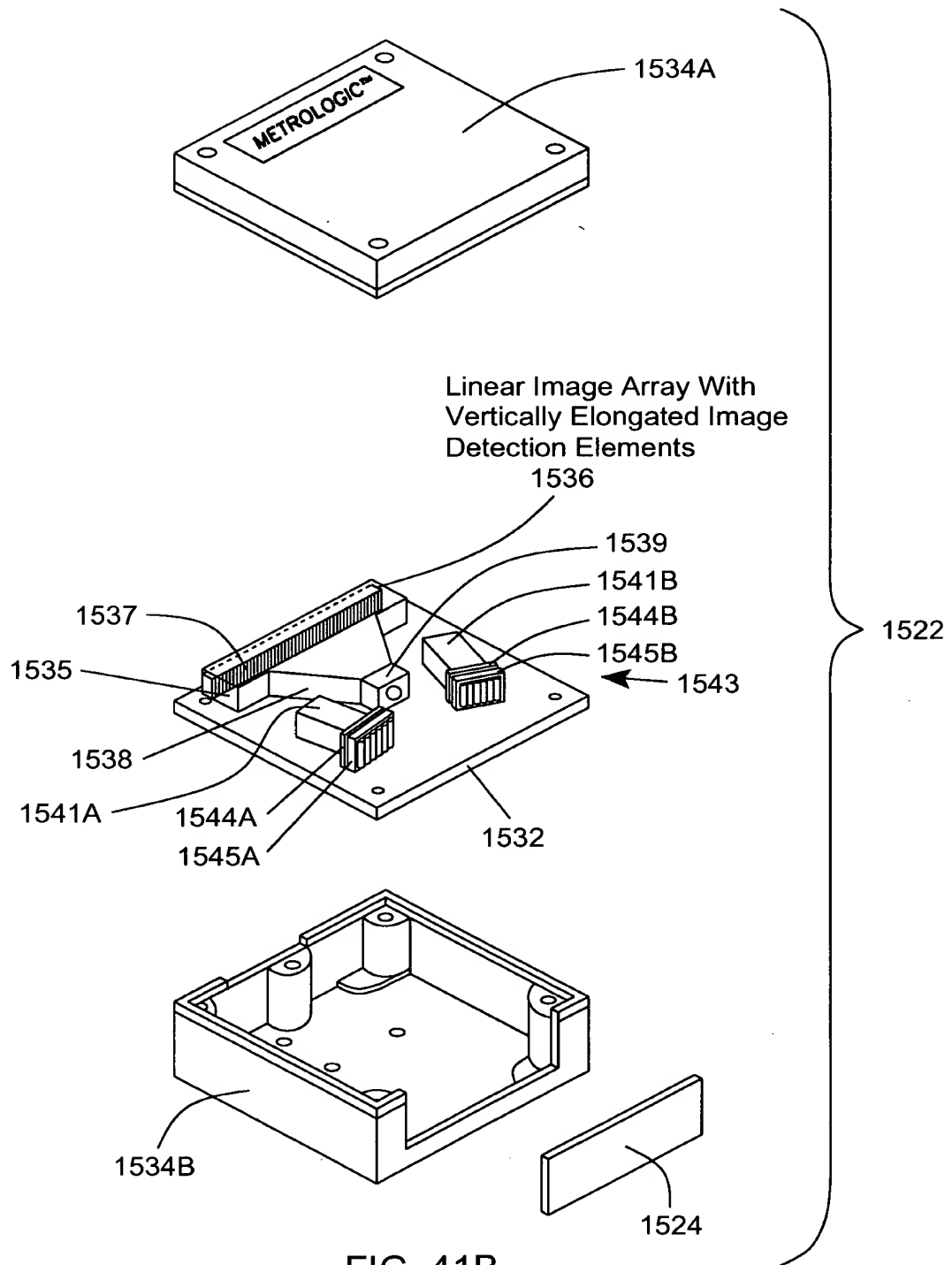


FIG. 41B

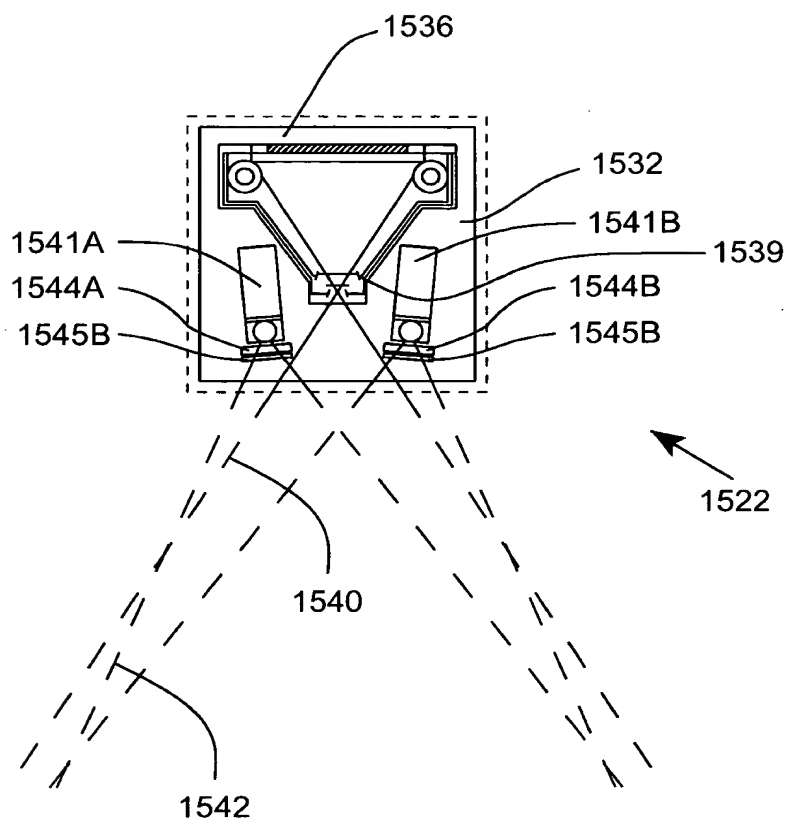


FIG. 41C

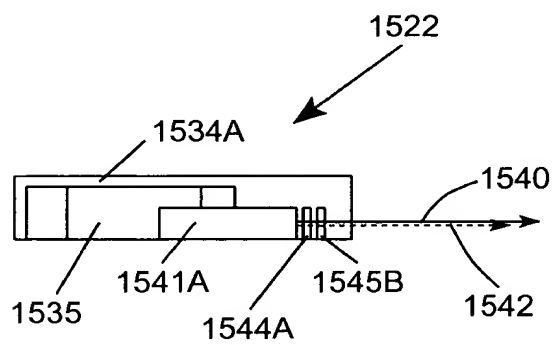


FIG. 41D

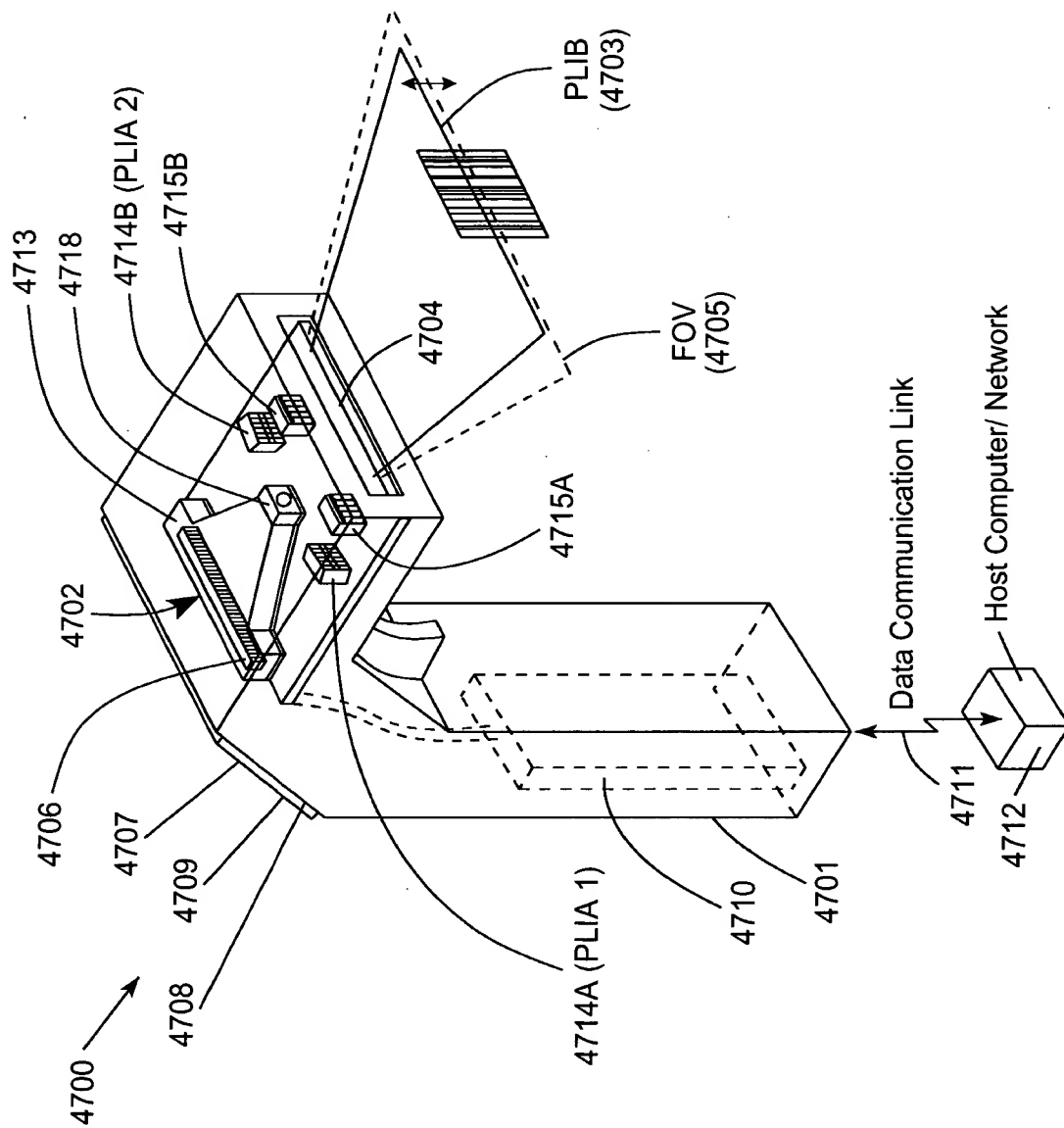


FIG. 42

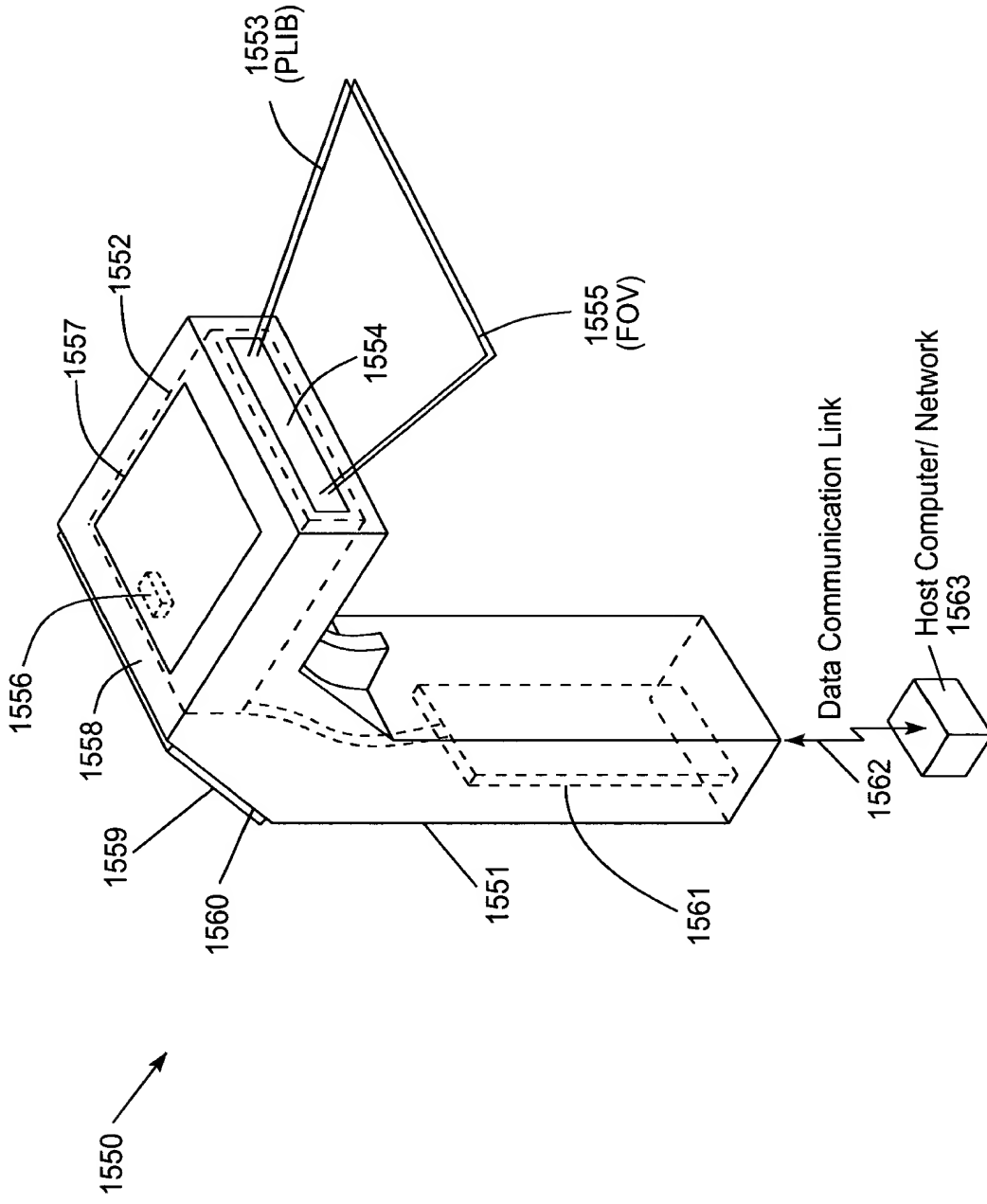


FIG. 42A

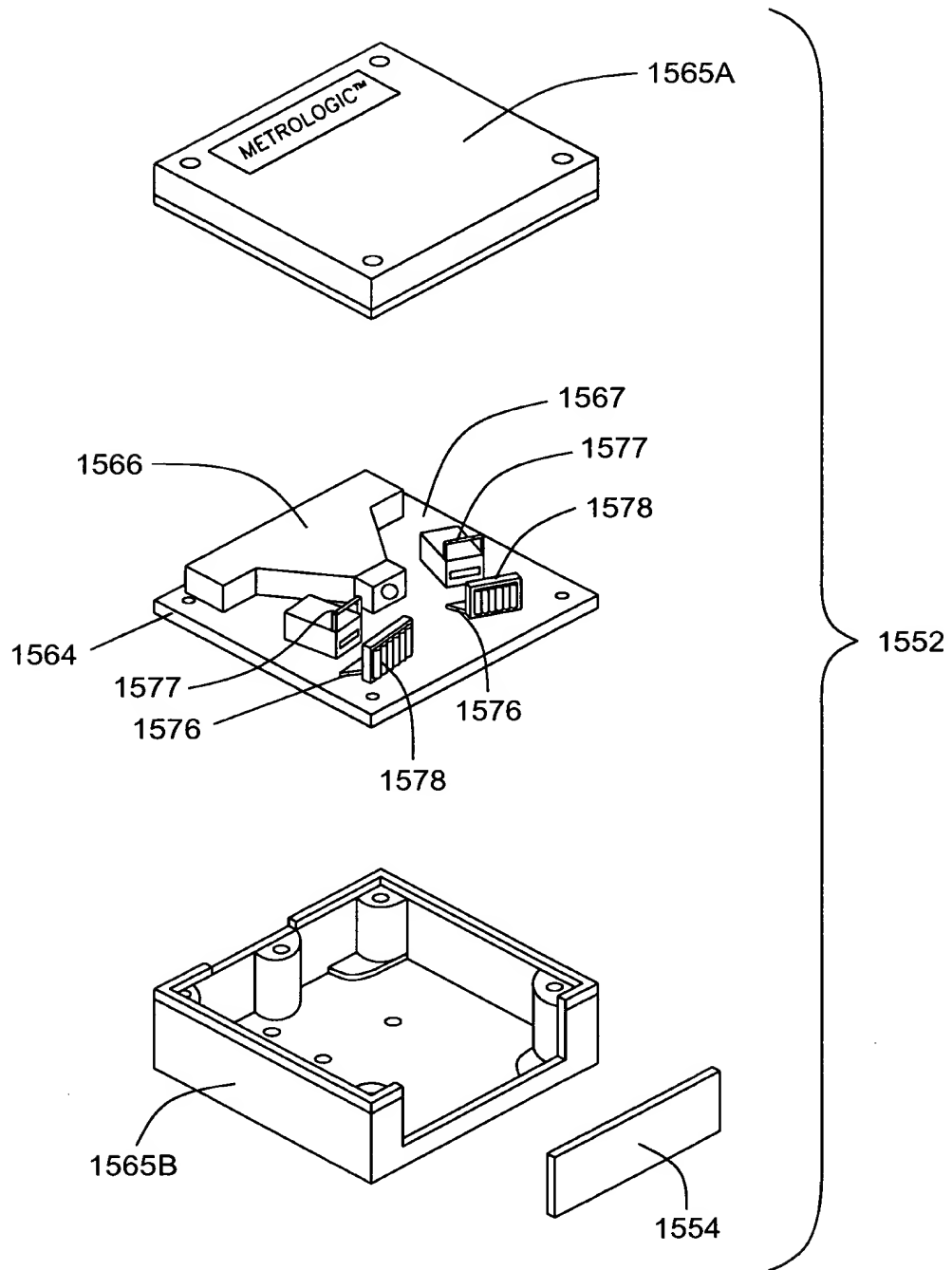


FIG. 42B

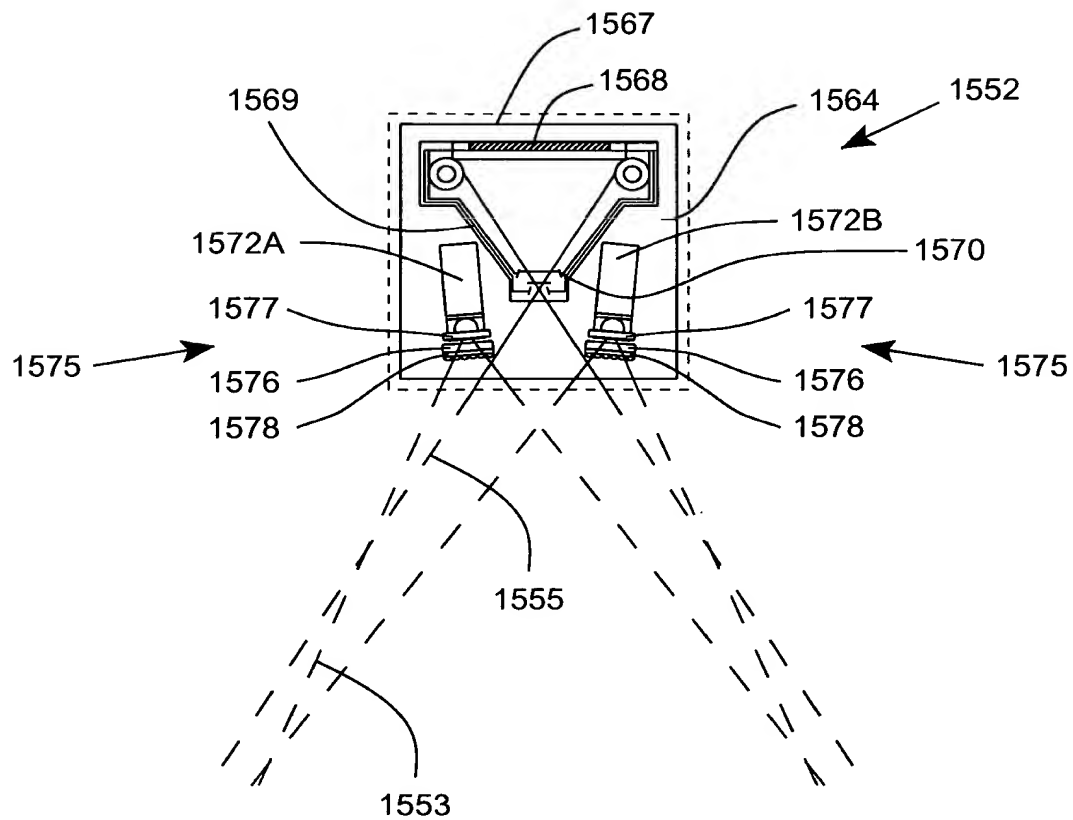


FIG. 42C

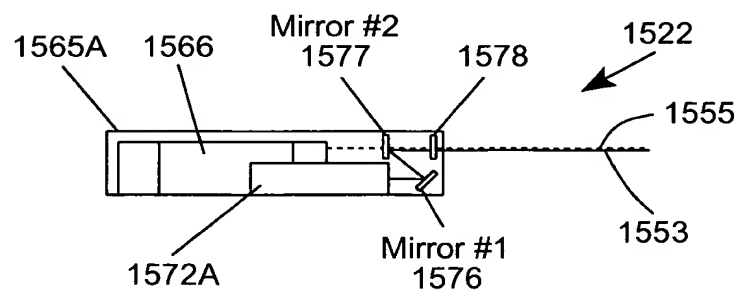
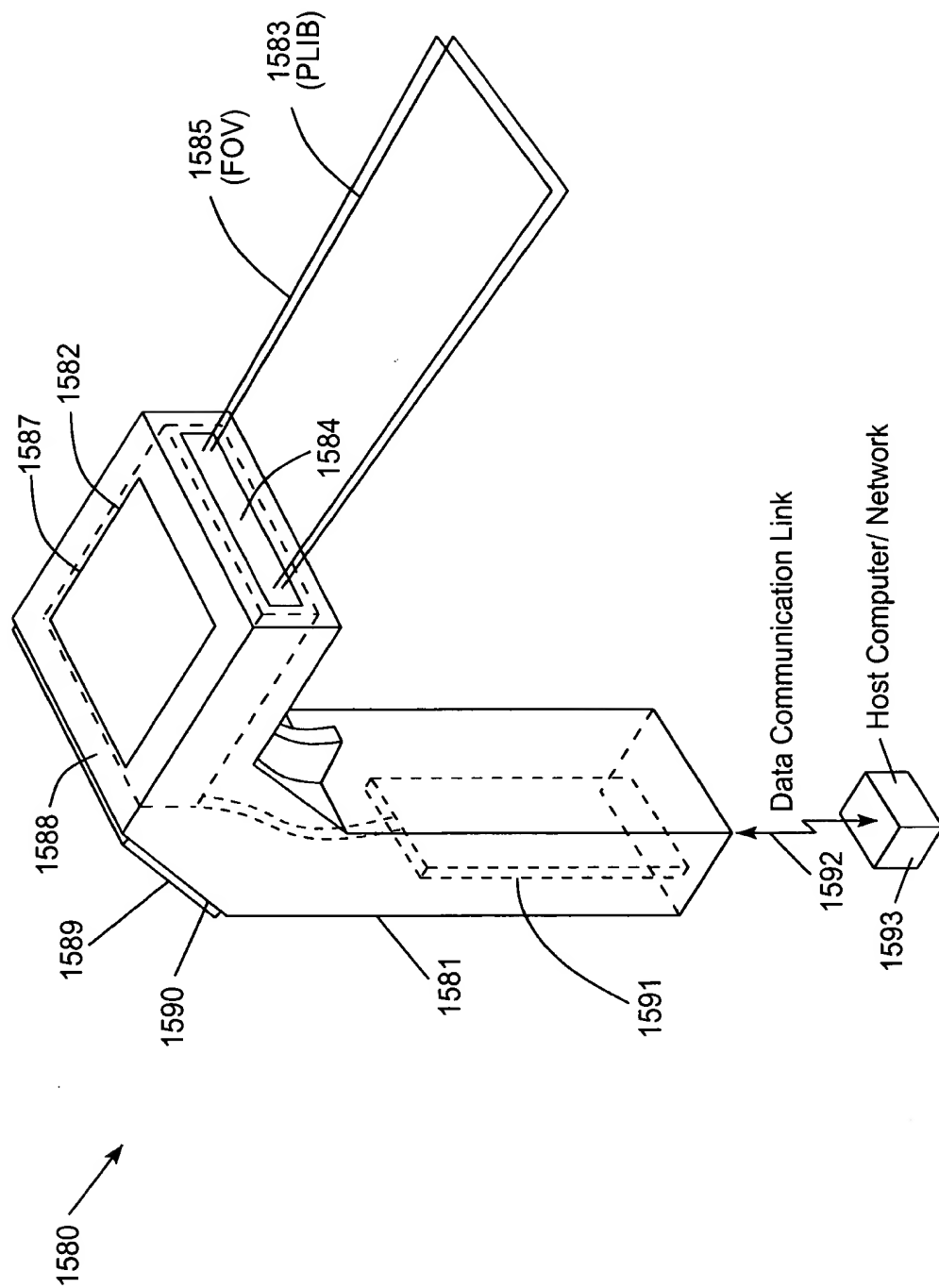


FIG. 42D



**FIG. 43A**



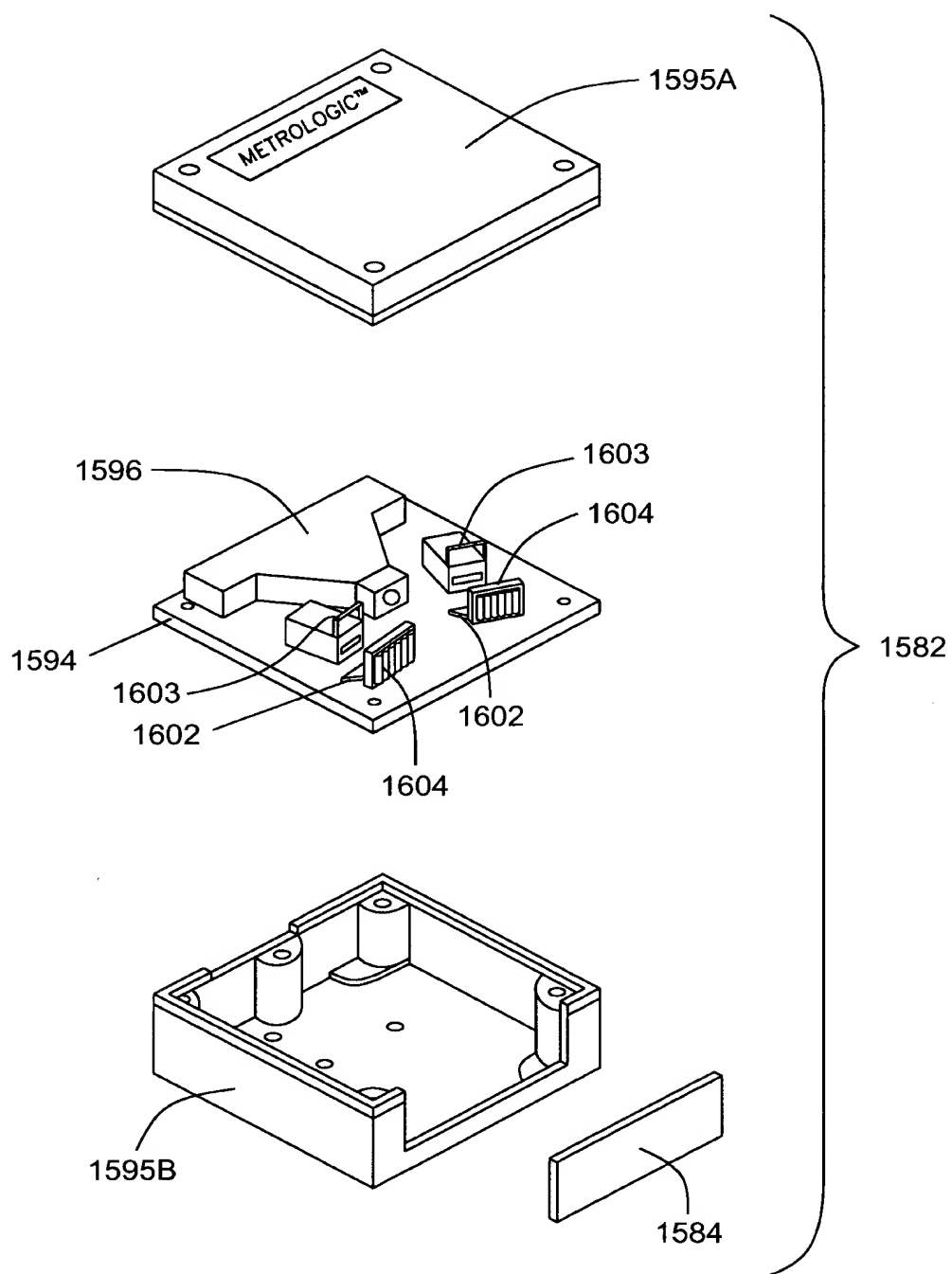


FIG. 43B

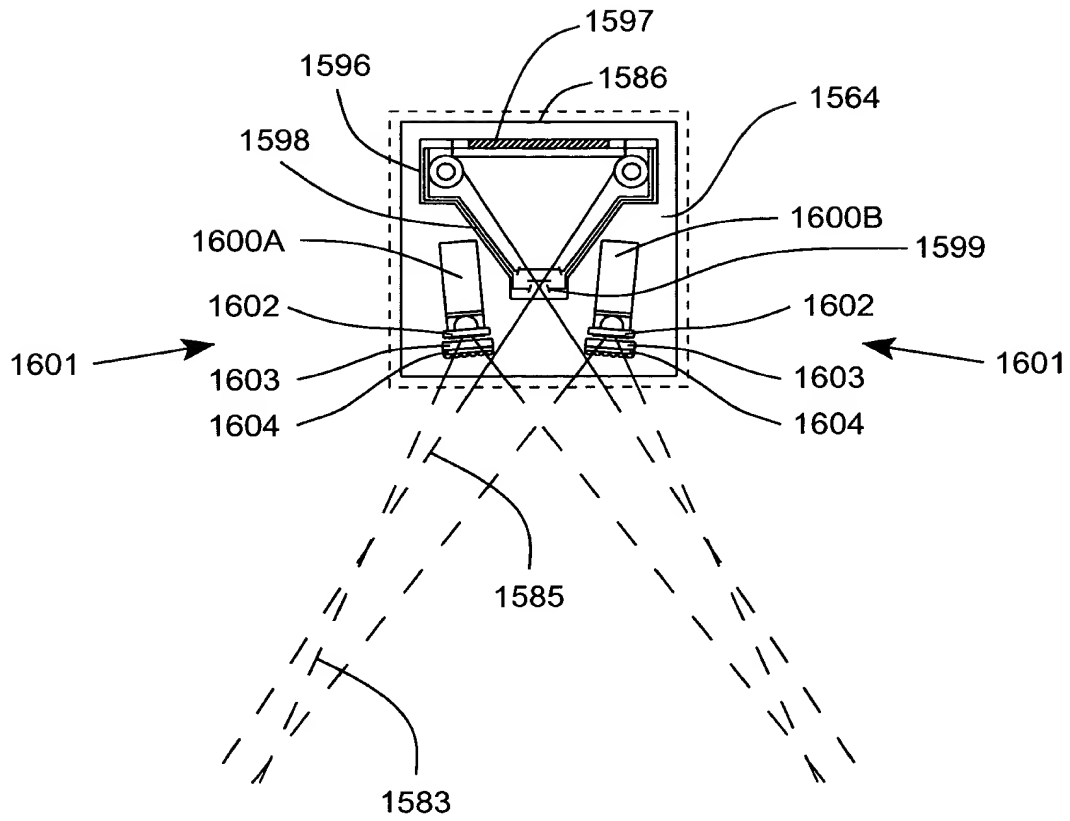


FIG. 43C

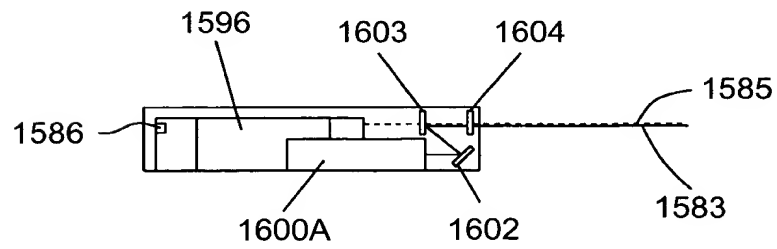


FIG. 43D

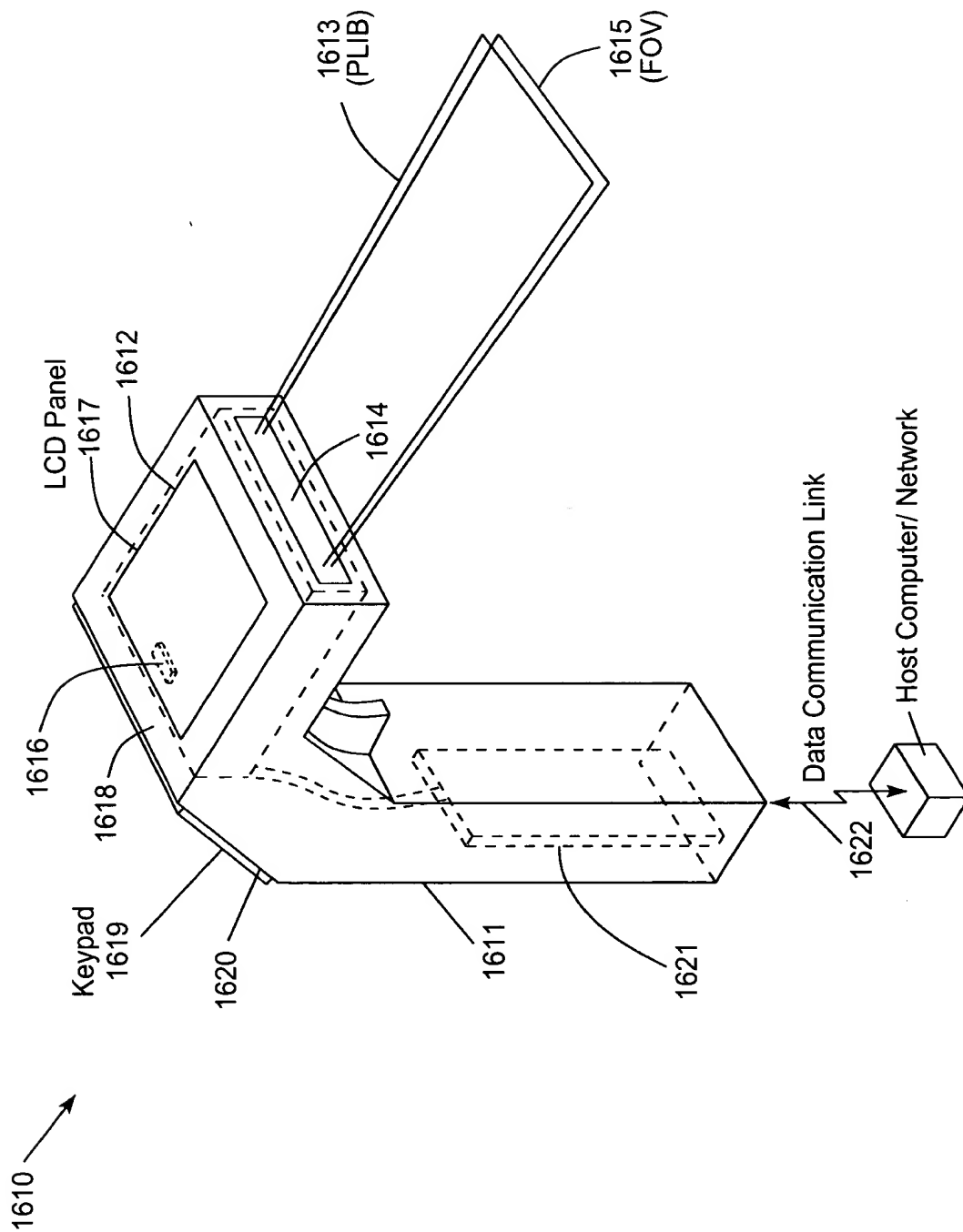


FIG. 44A

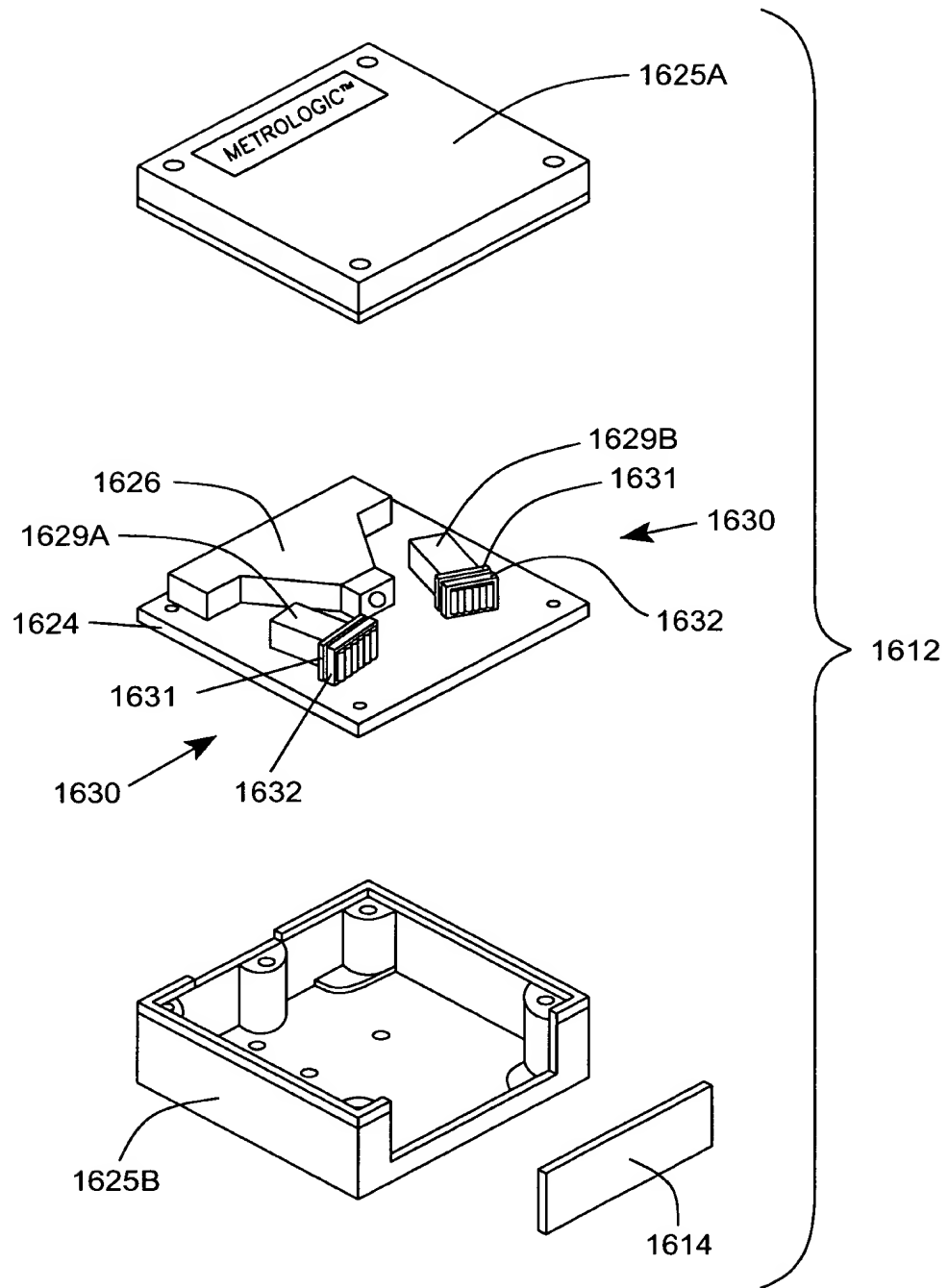


FIG. 44B

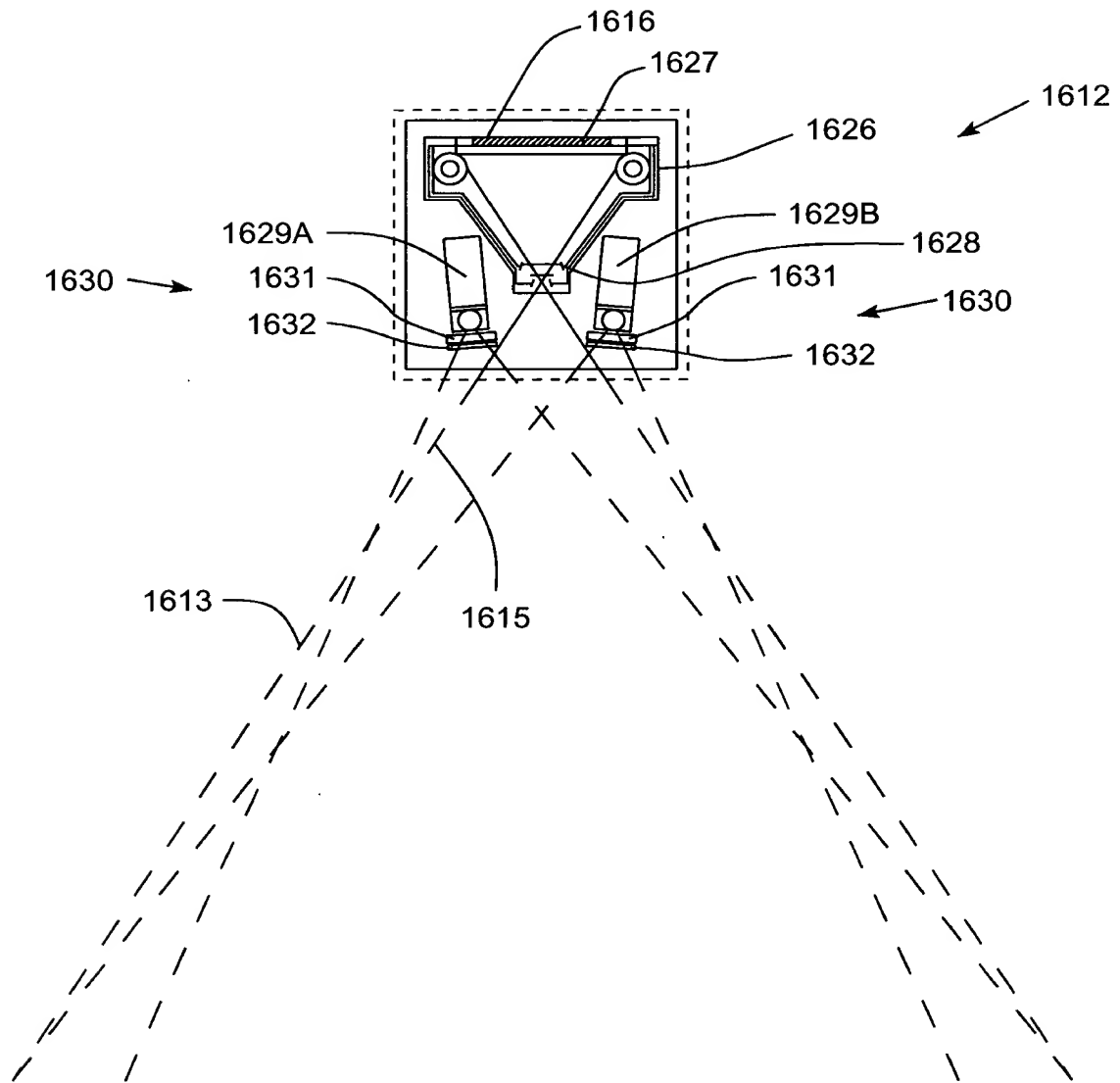


FIG. 44C

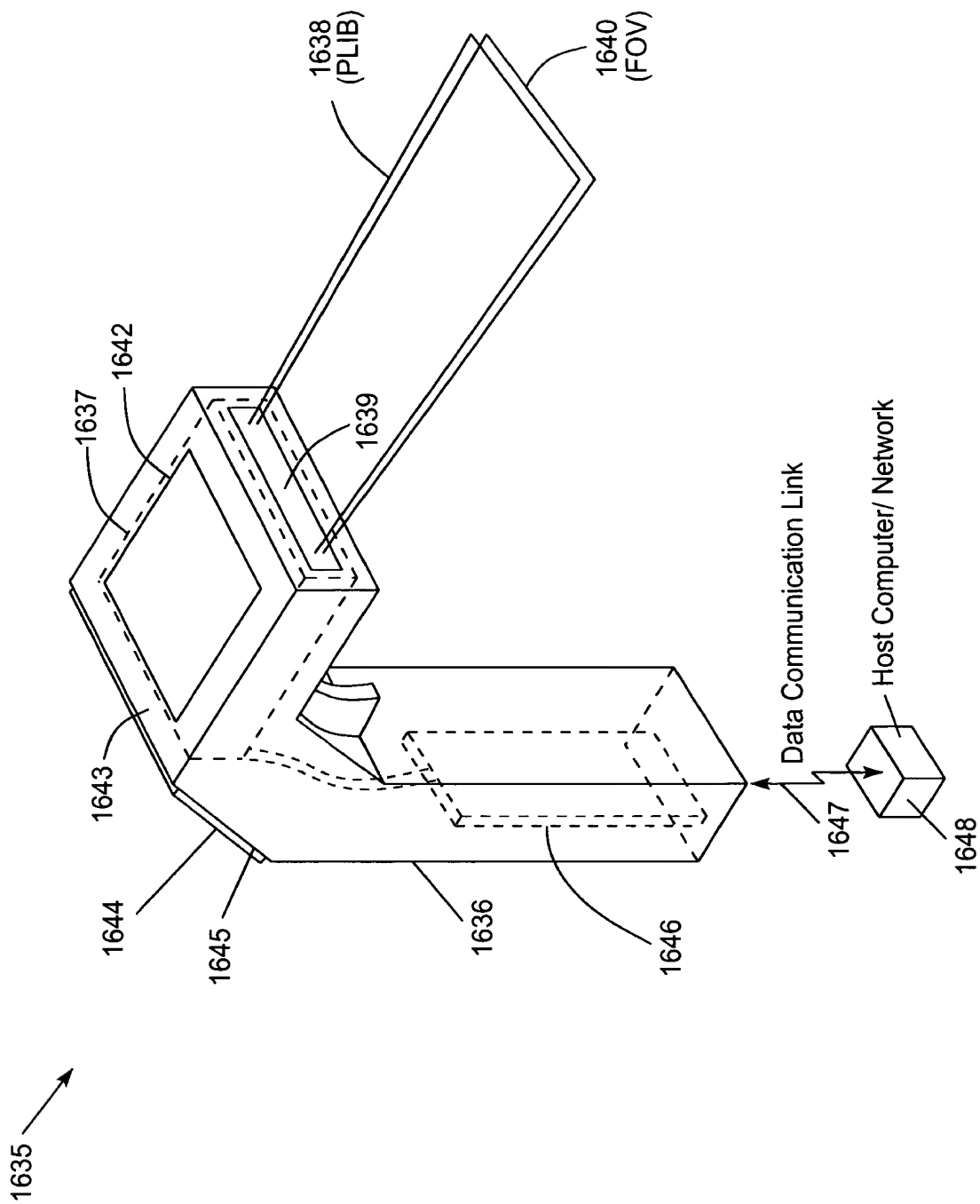


FIG. 45A

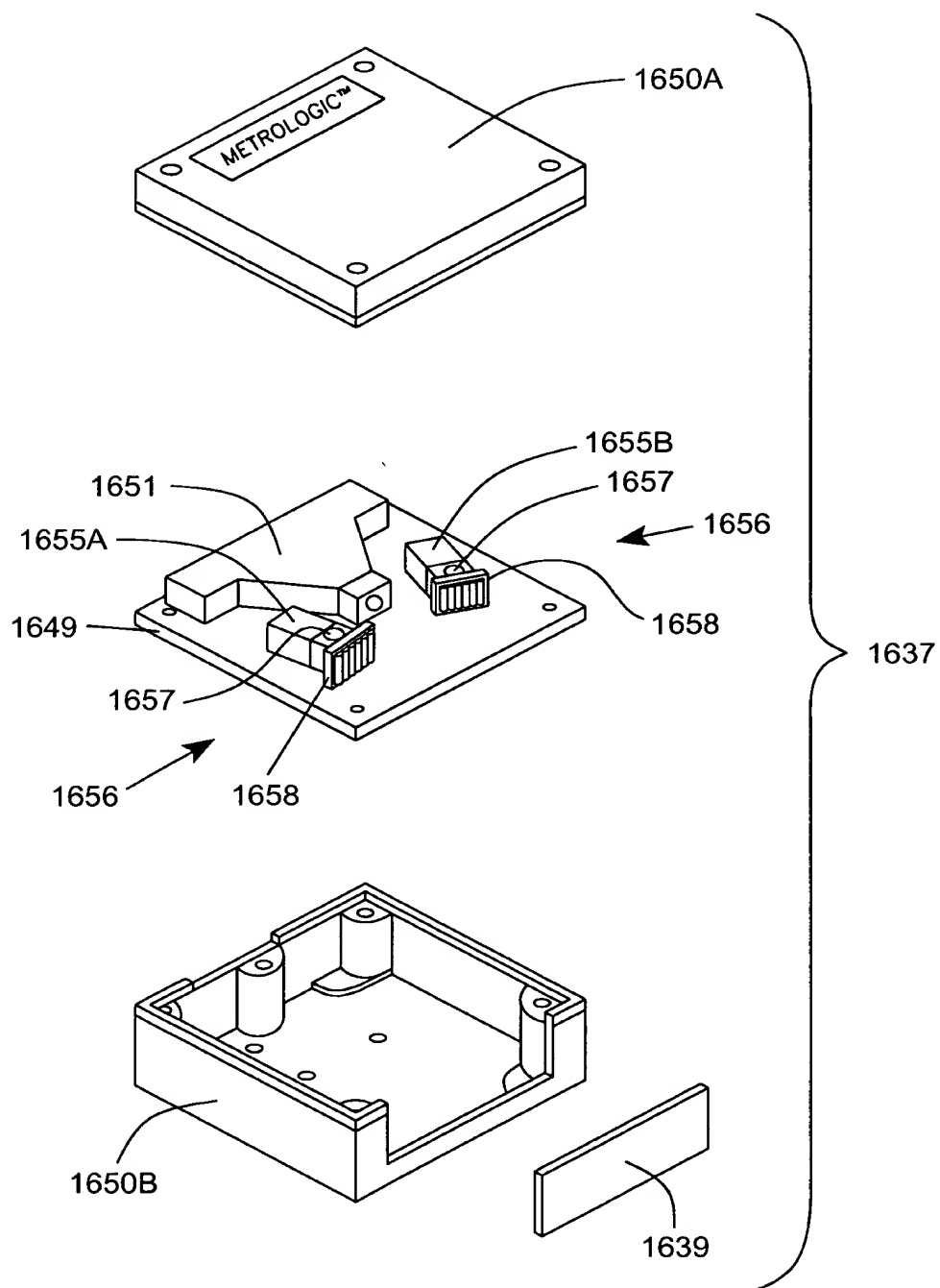


FIG. 45B

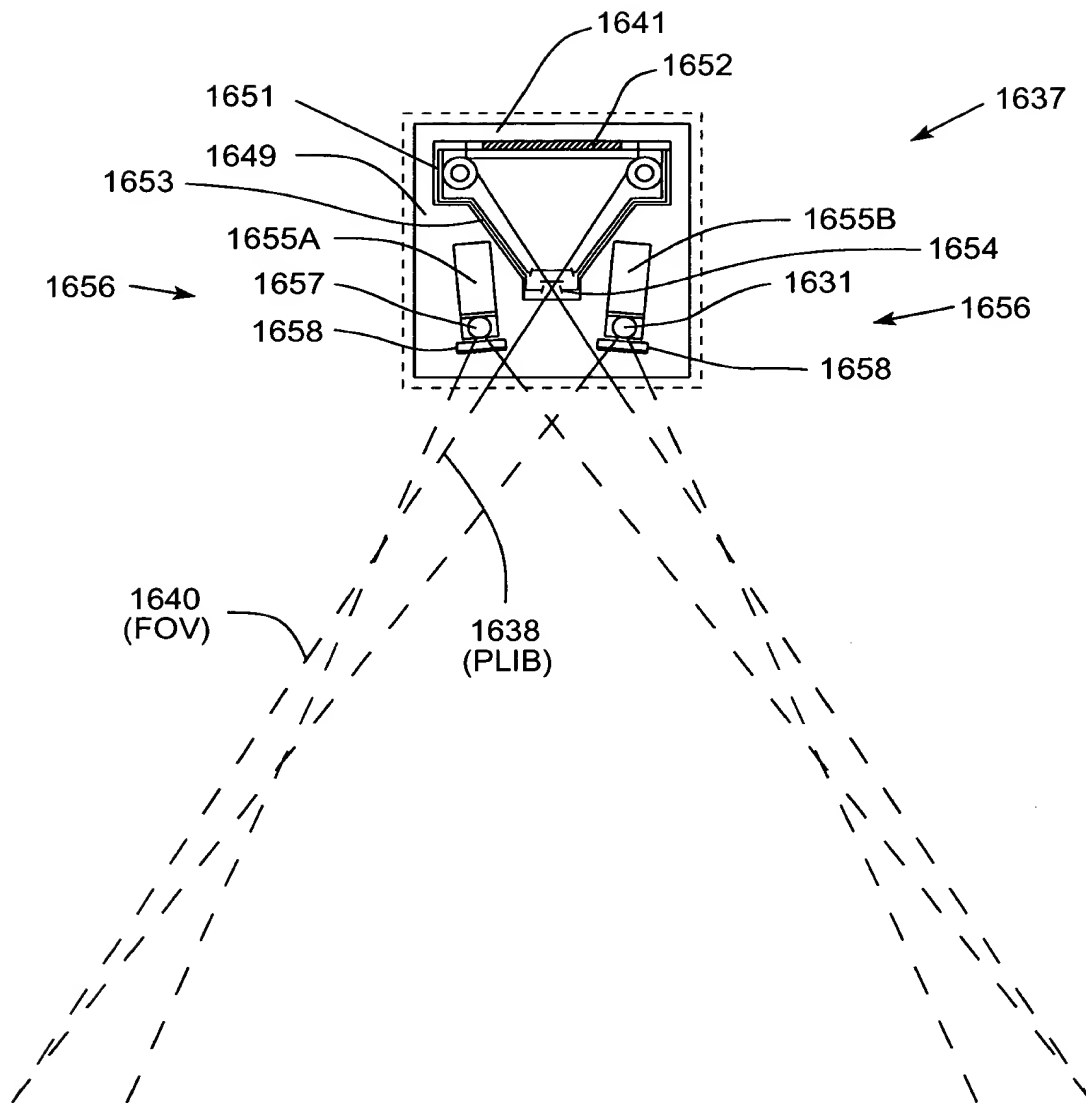


FIG. 45C



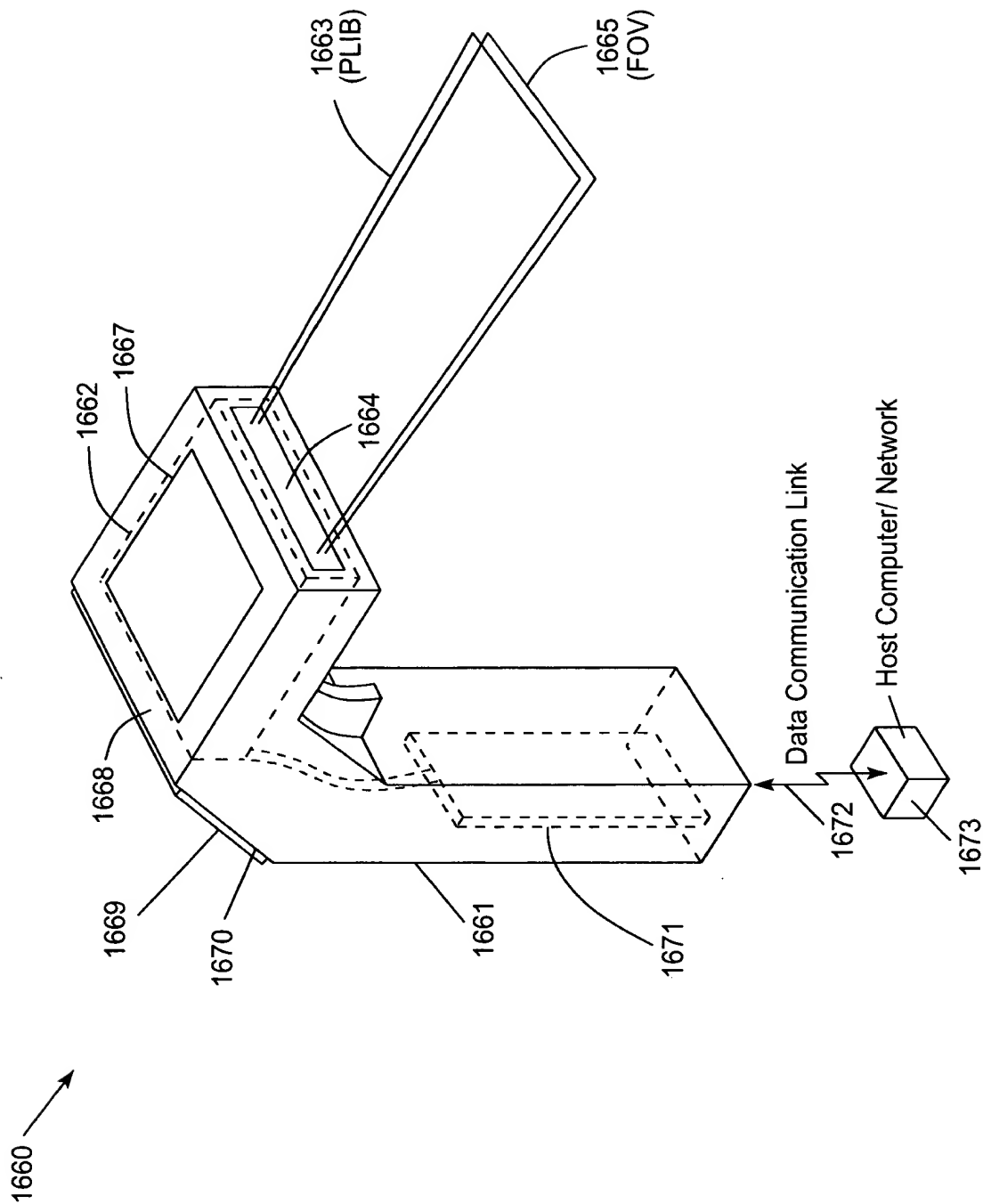


FIG. 46A

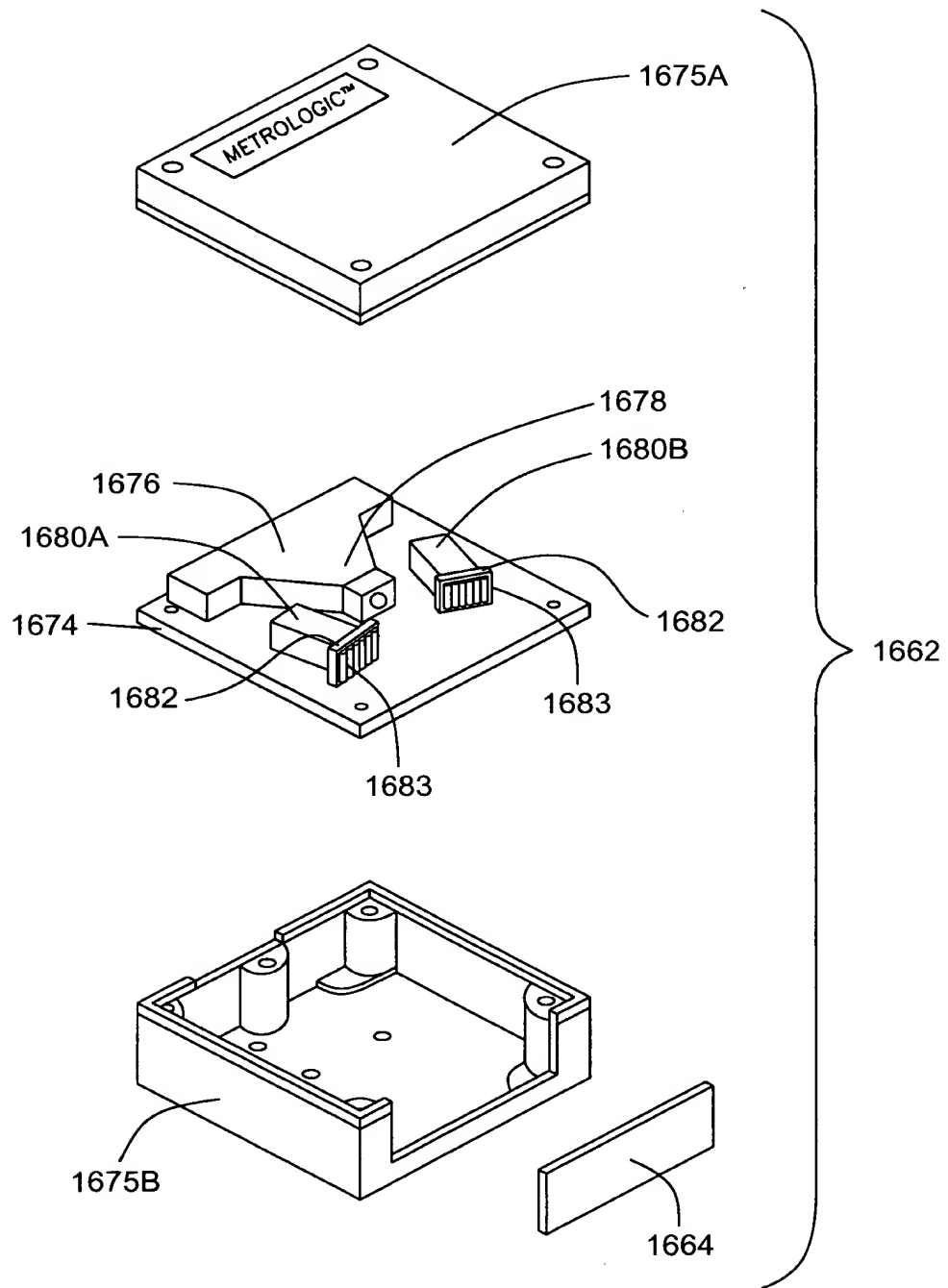


FIG. 46B

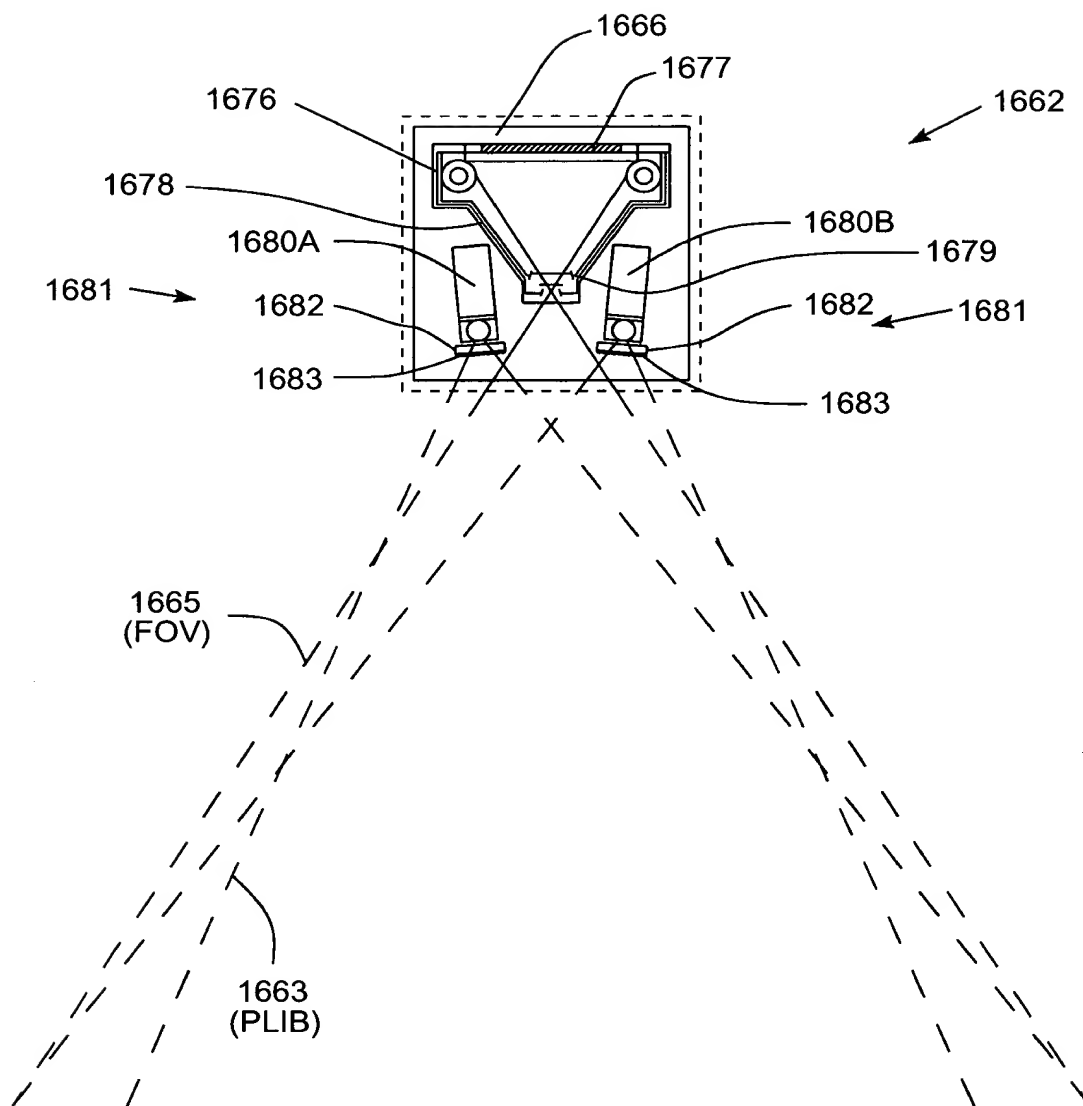


FIG. 46C

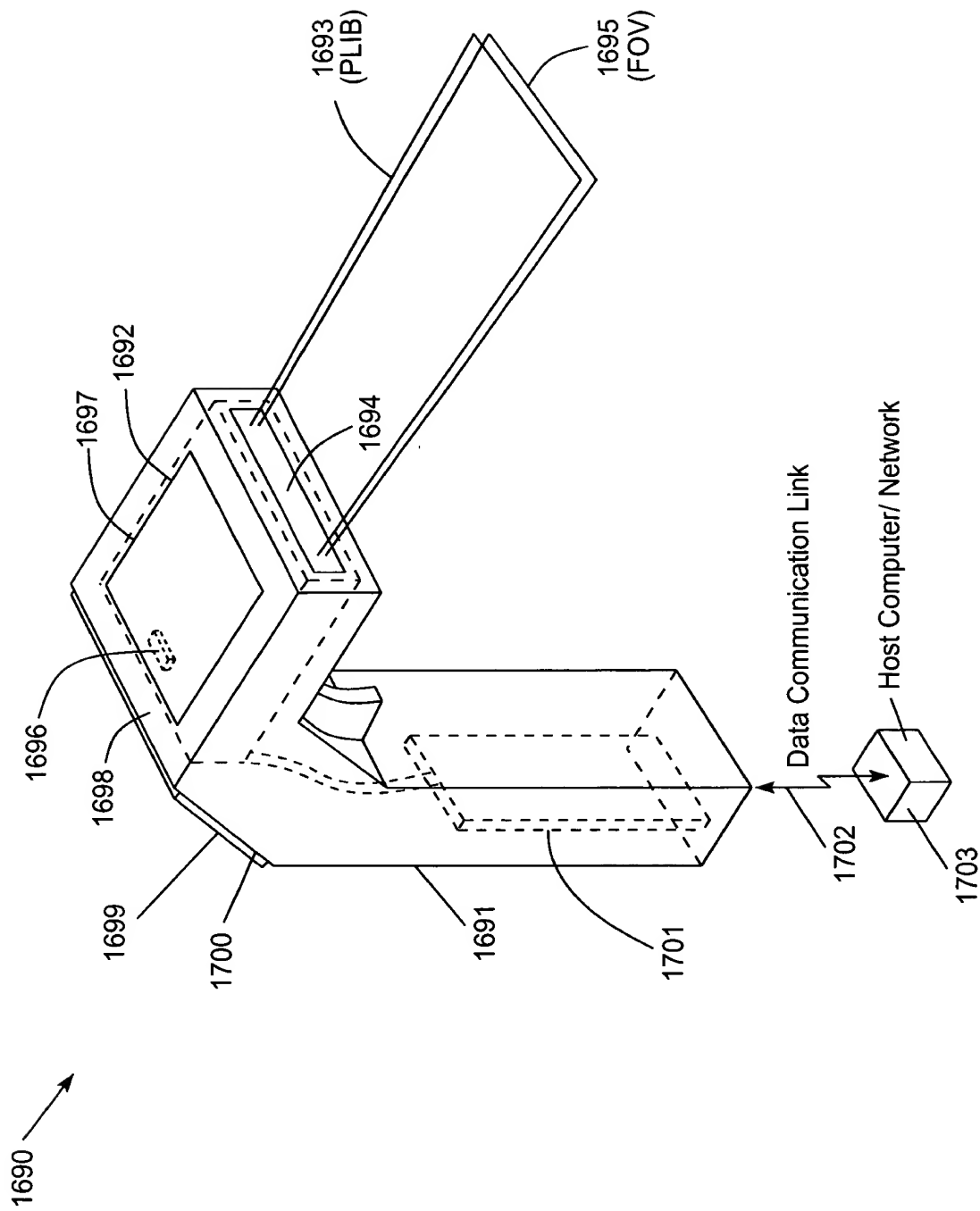


FIG. 47A

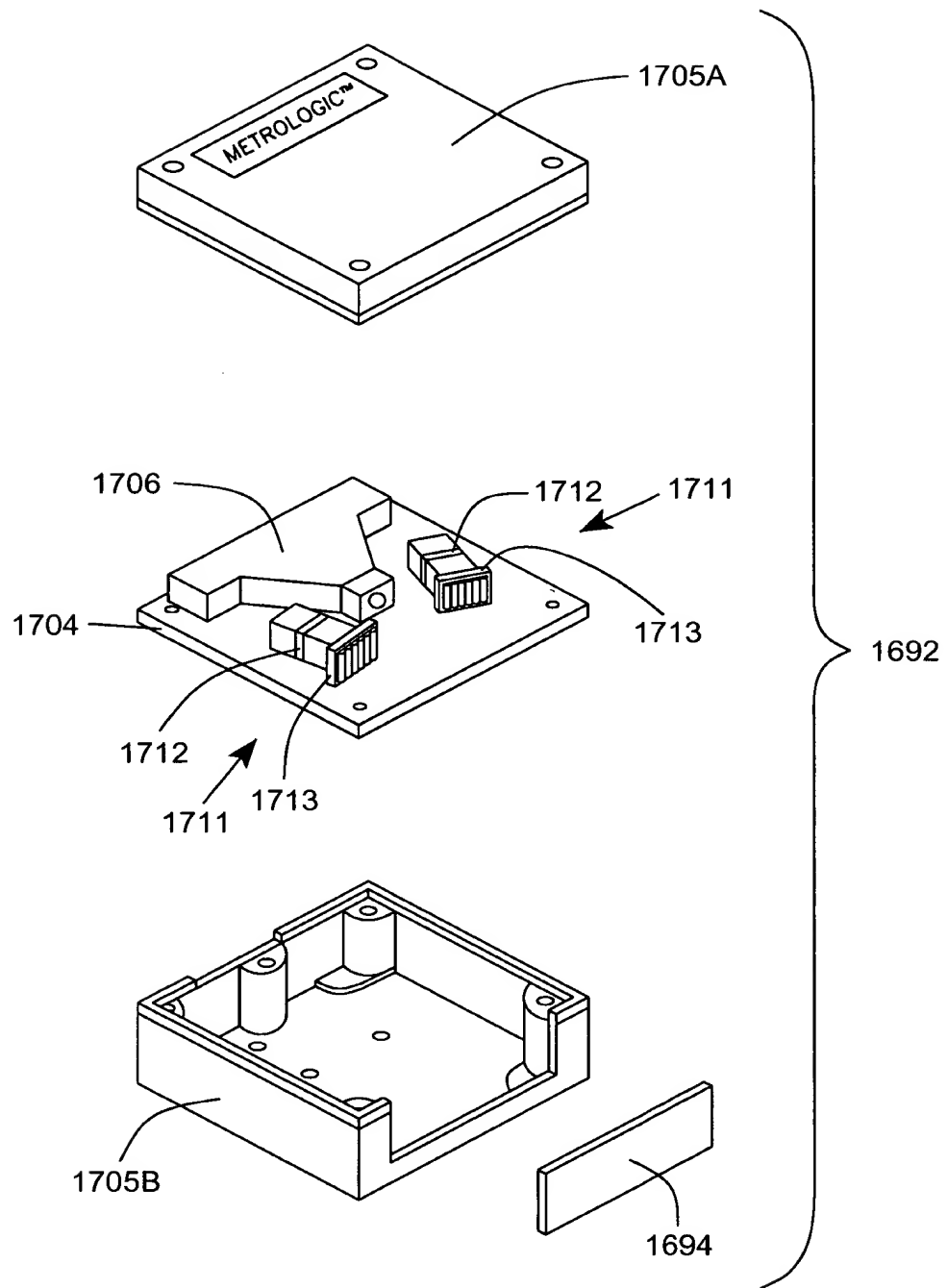


FIG. 47B

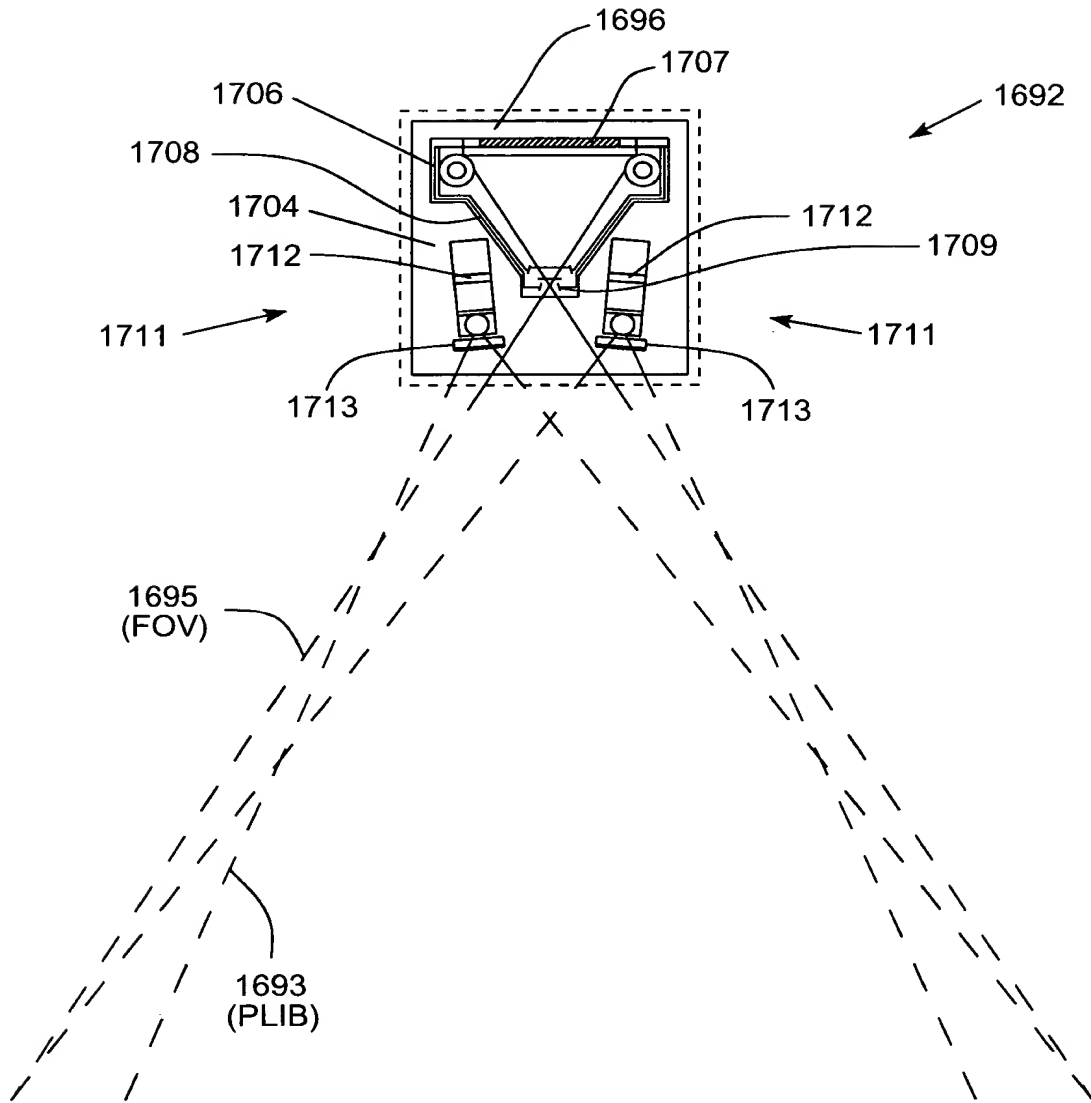


FIG. 47C

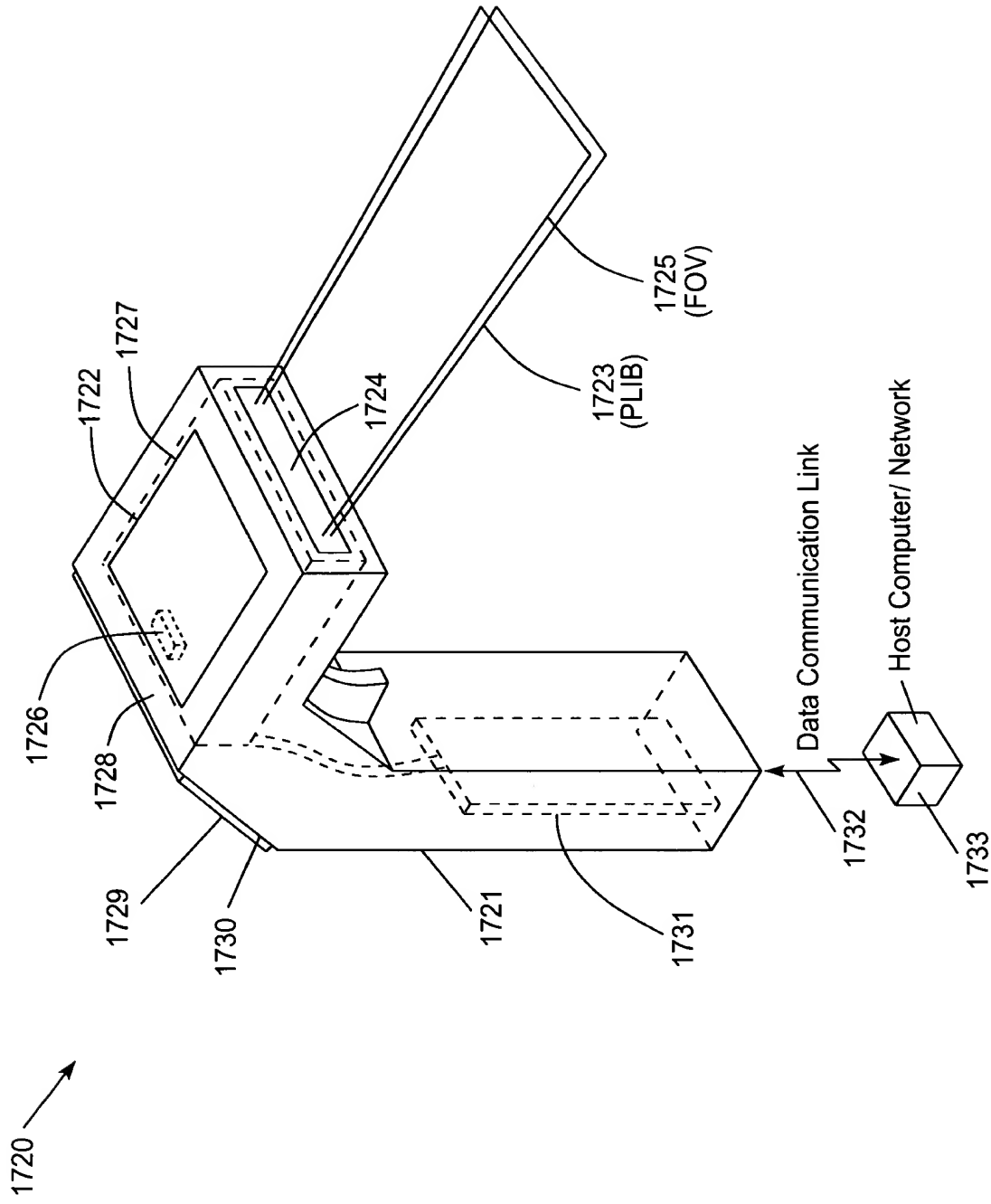


FIG. 48A

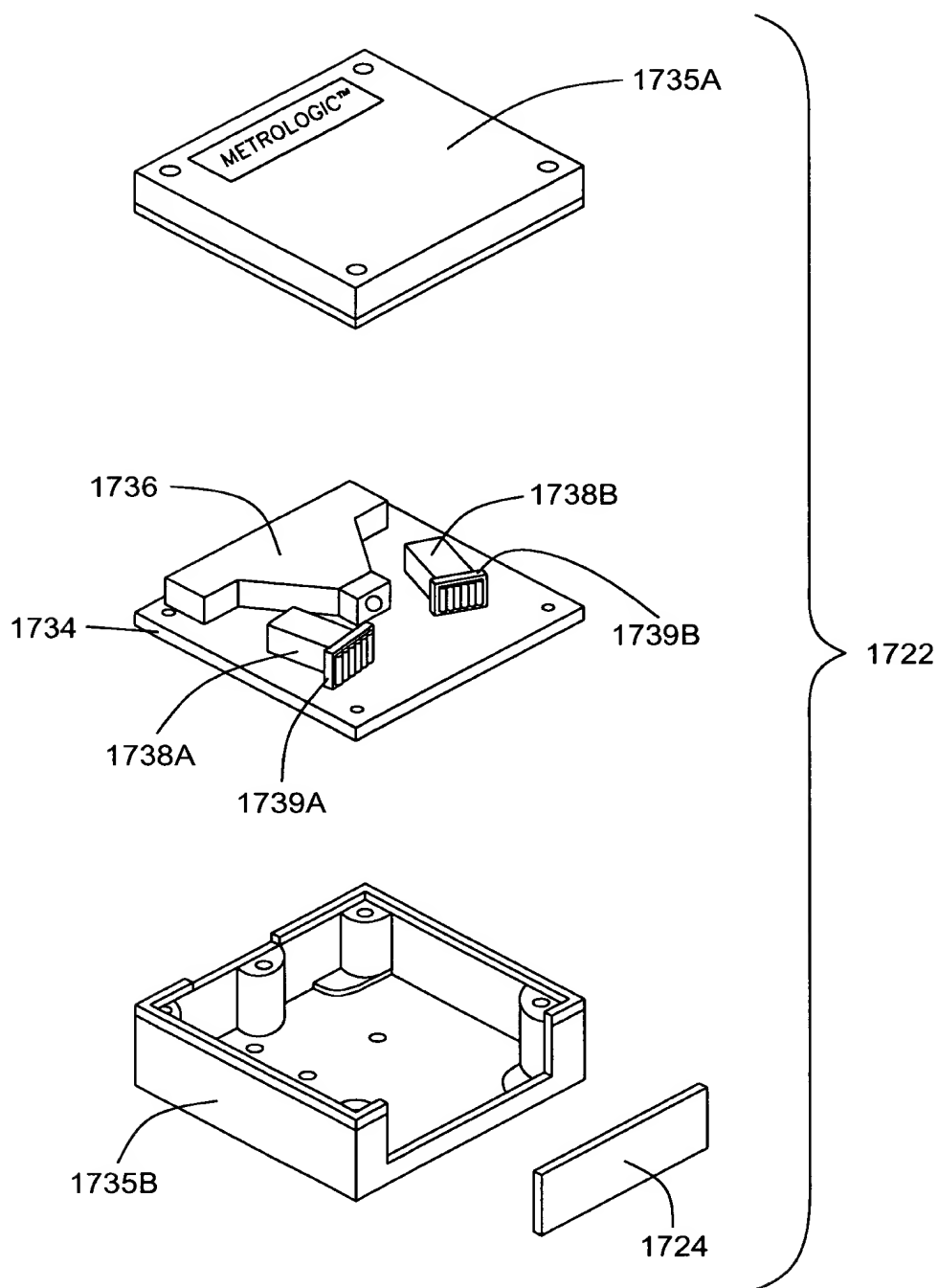


FIG. 48B



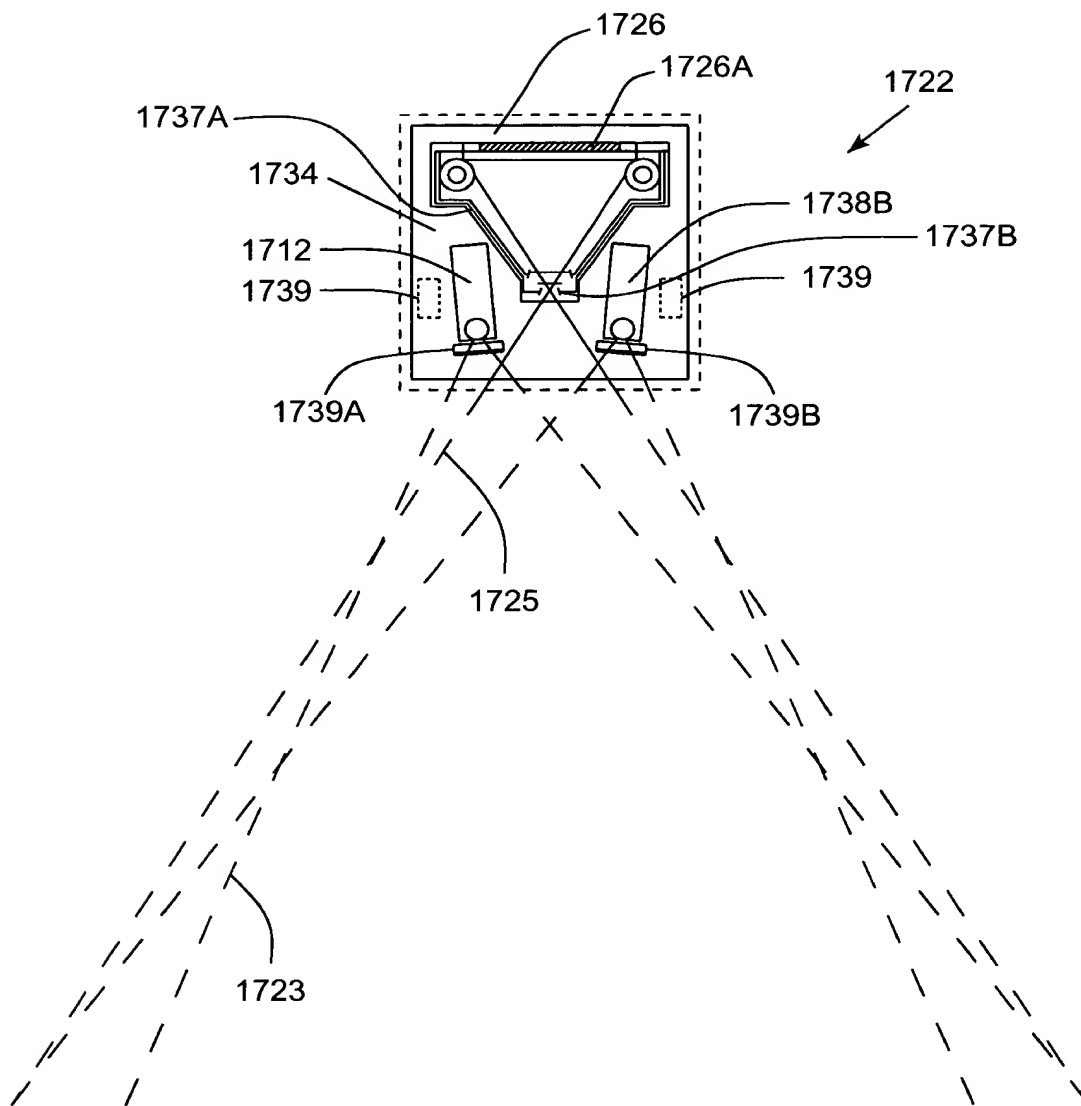


FIG. 48C

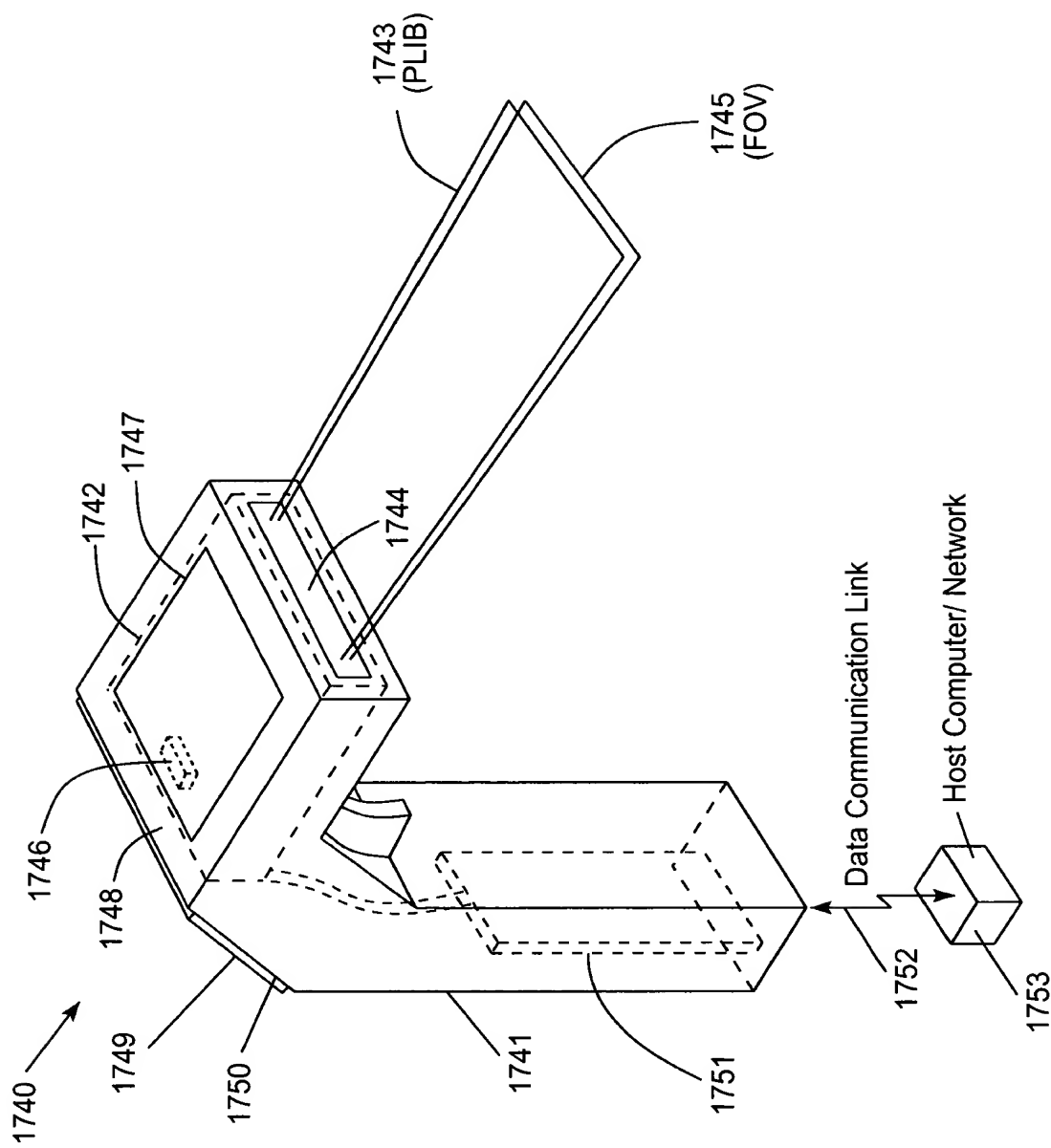


FIG. 49A

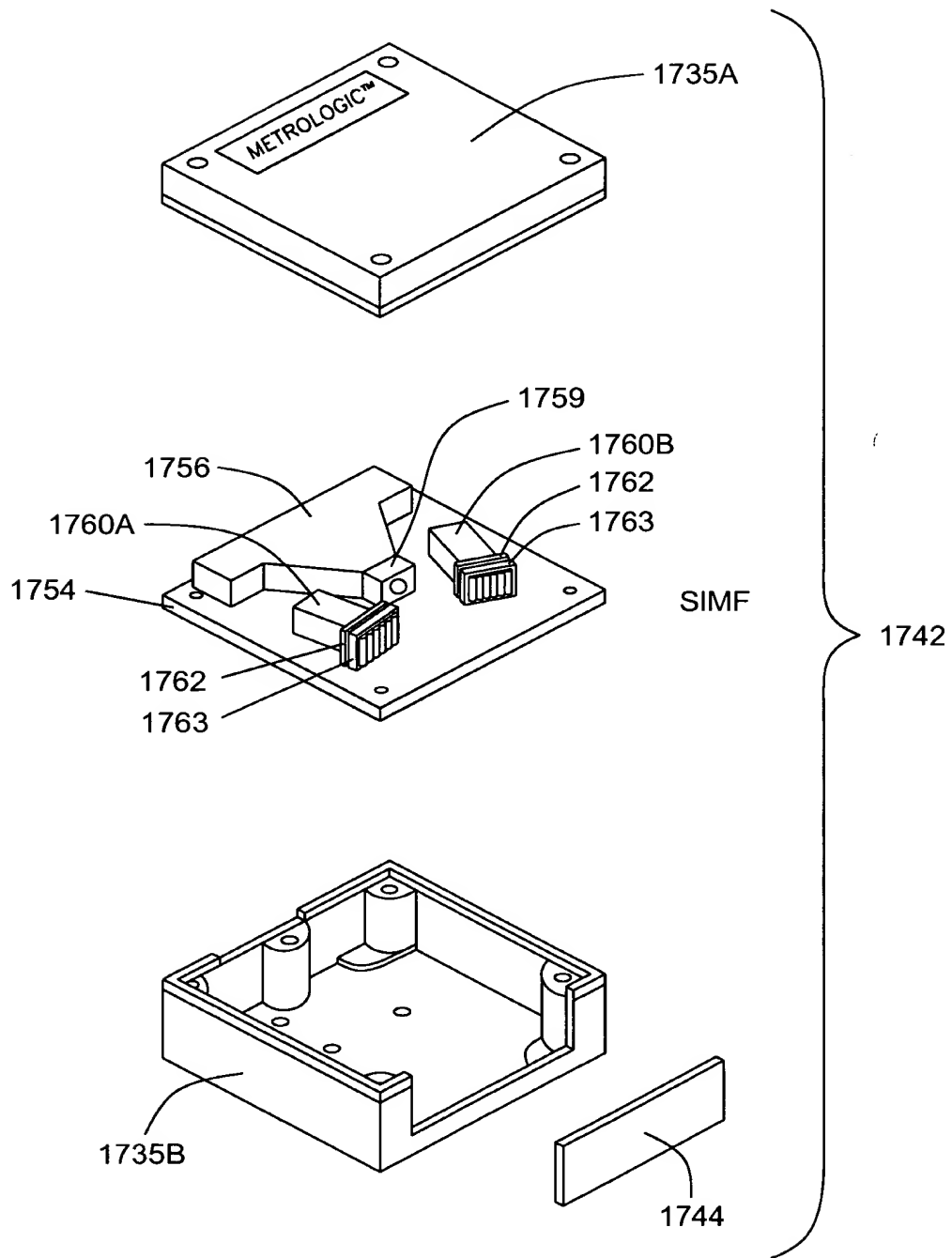


FIG. 49B

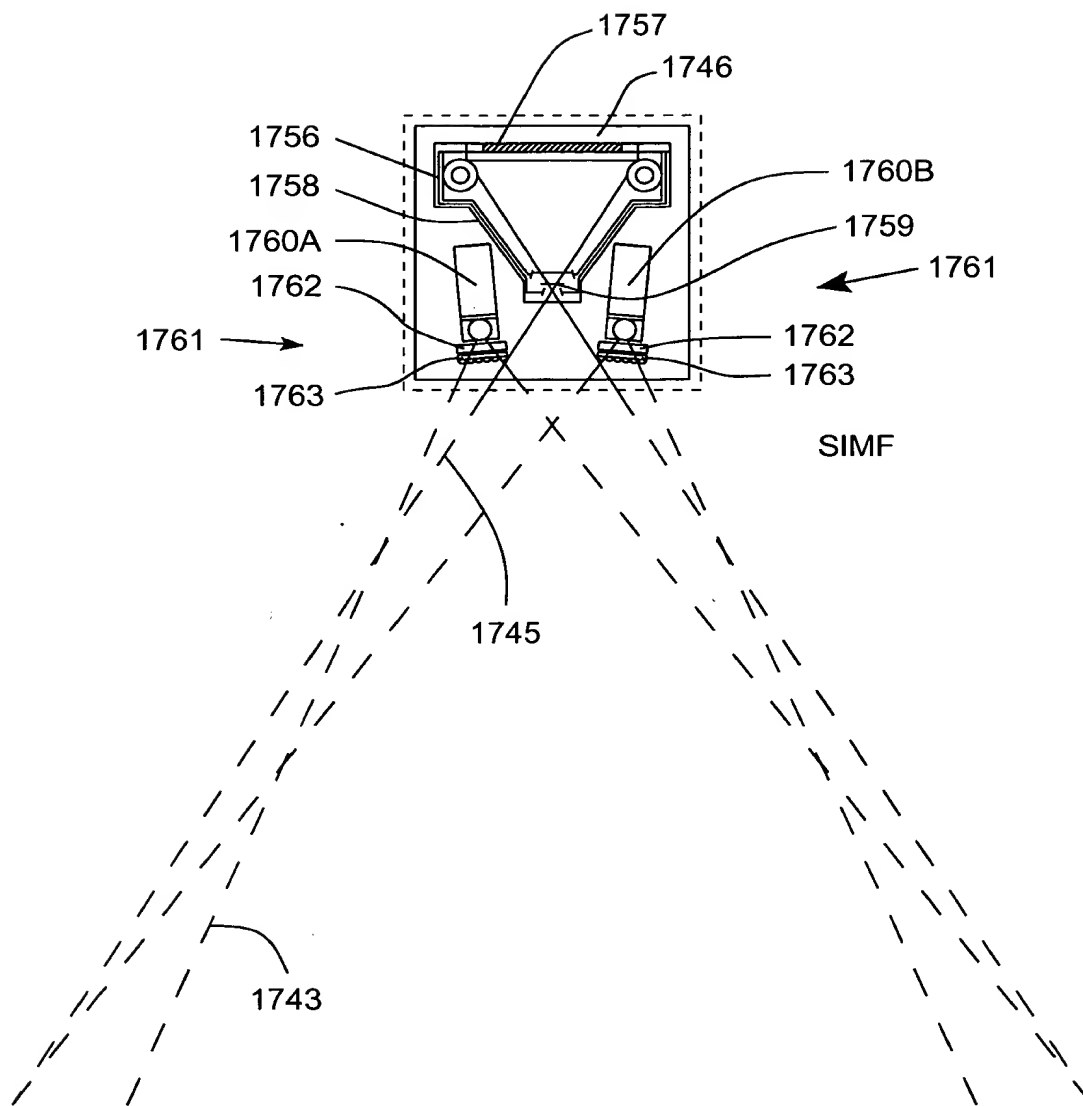


FIG. 49C

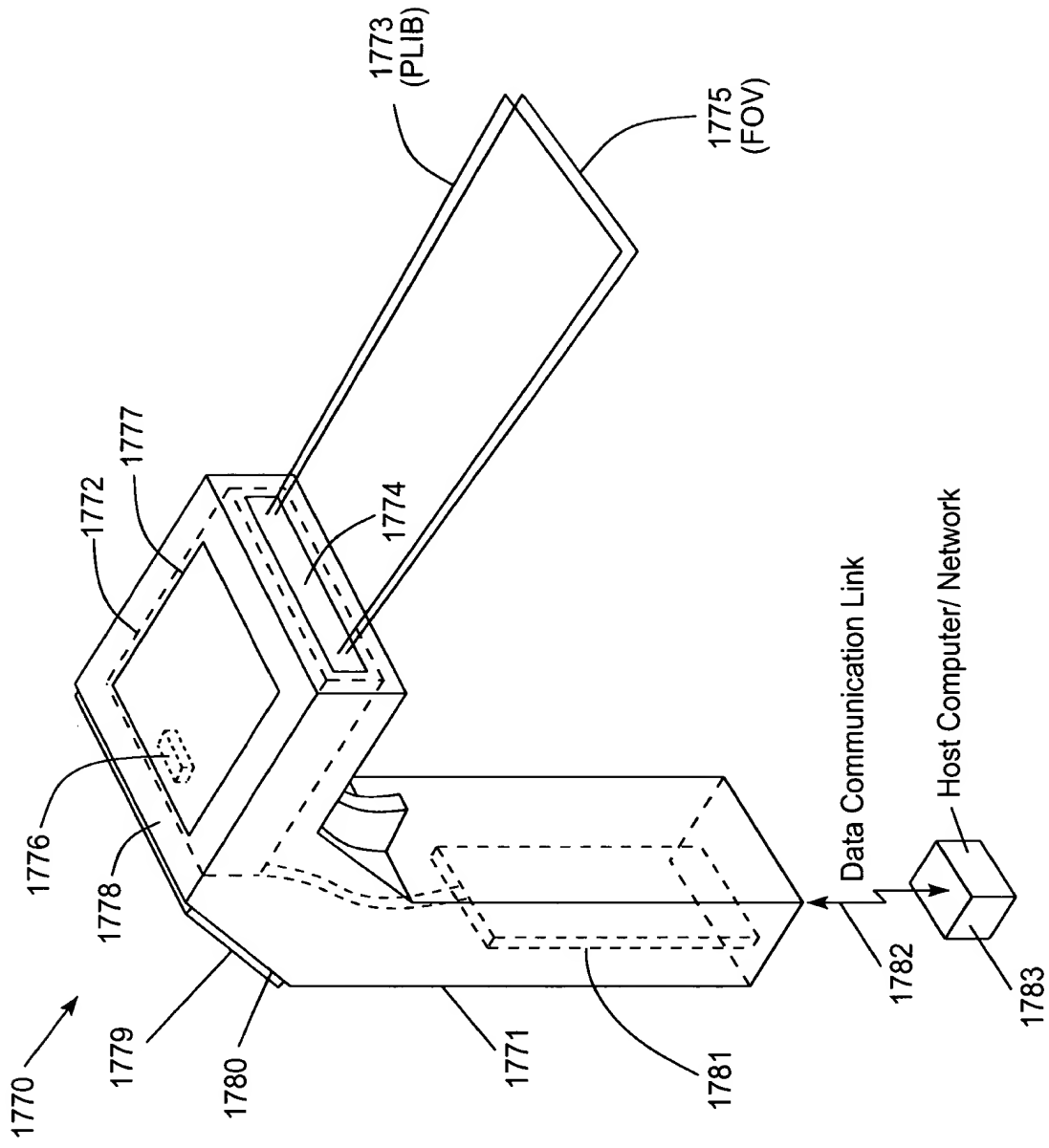


FIG. 50A

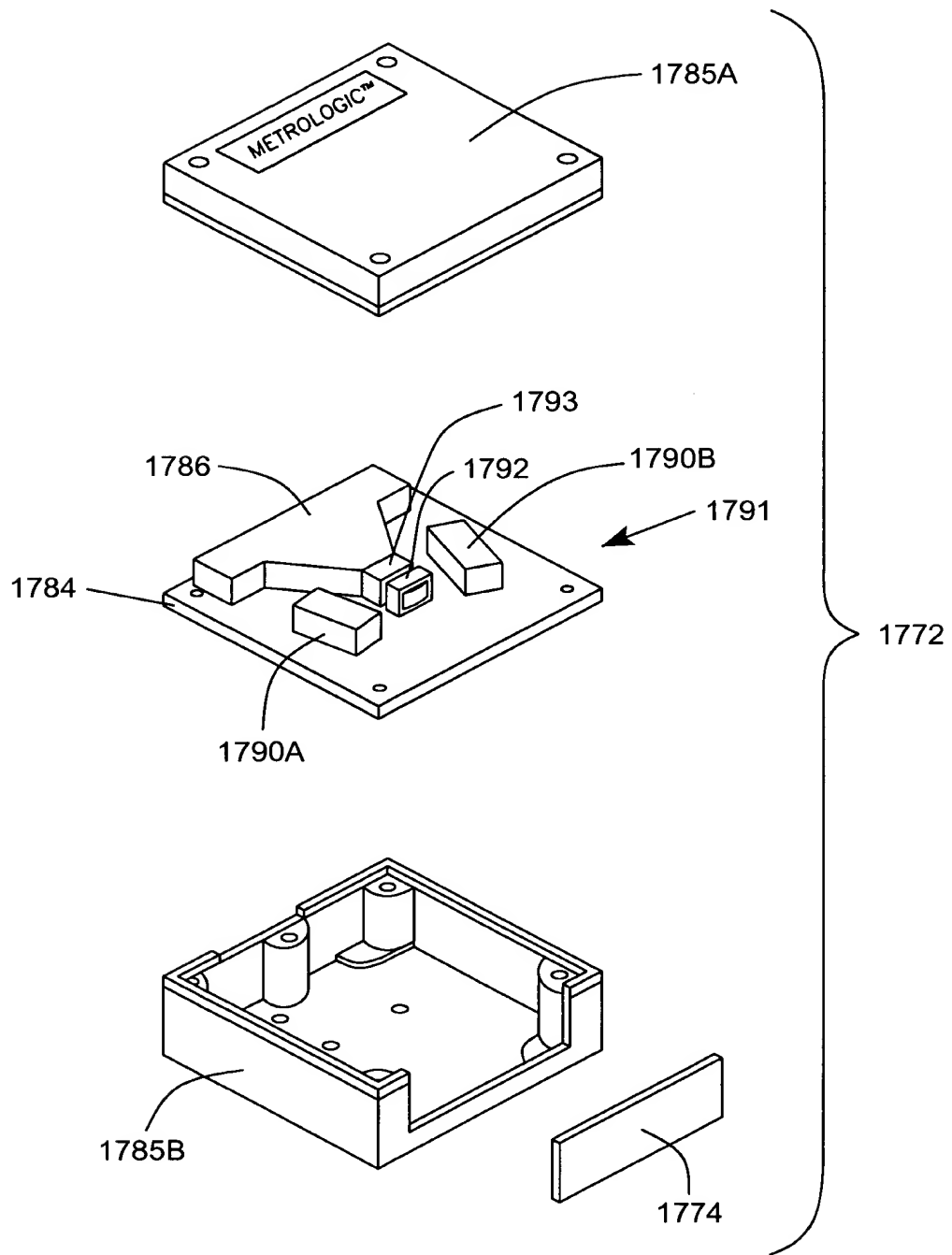
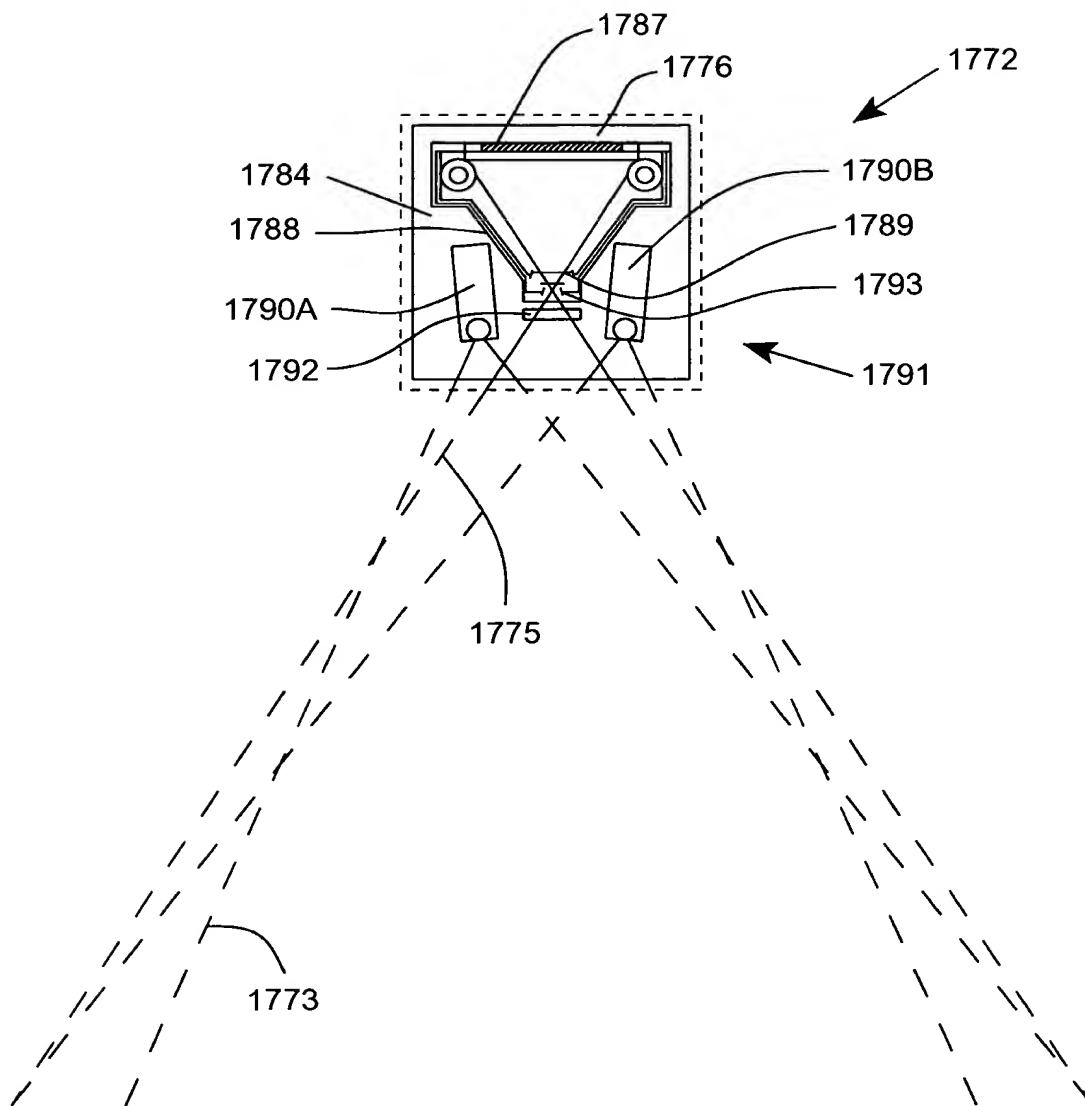


FIG. 50B



**FIG. 50C**

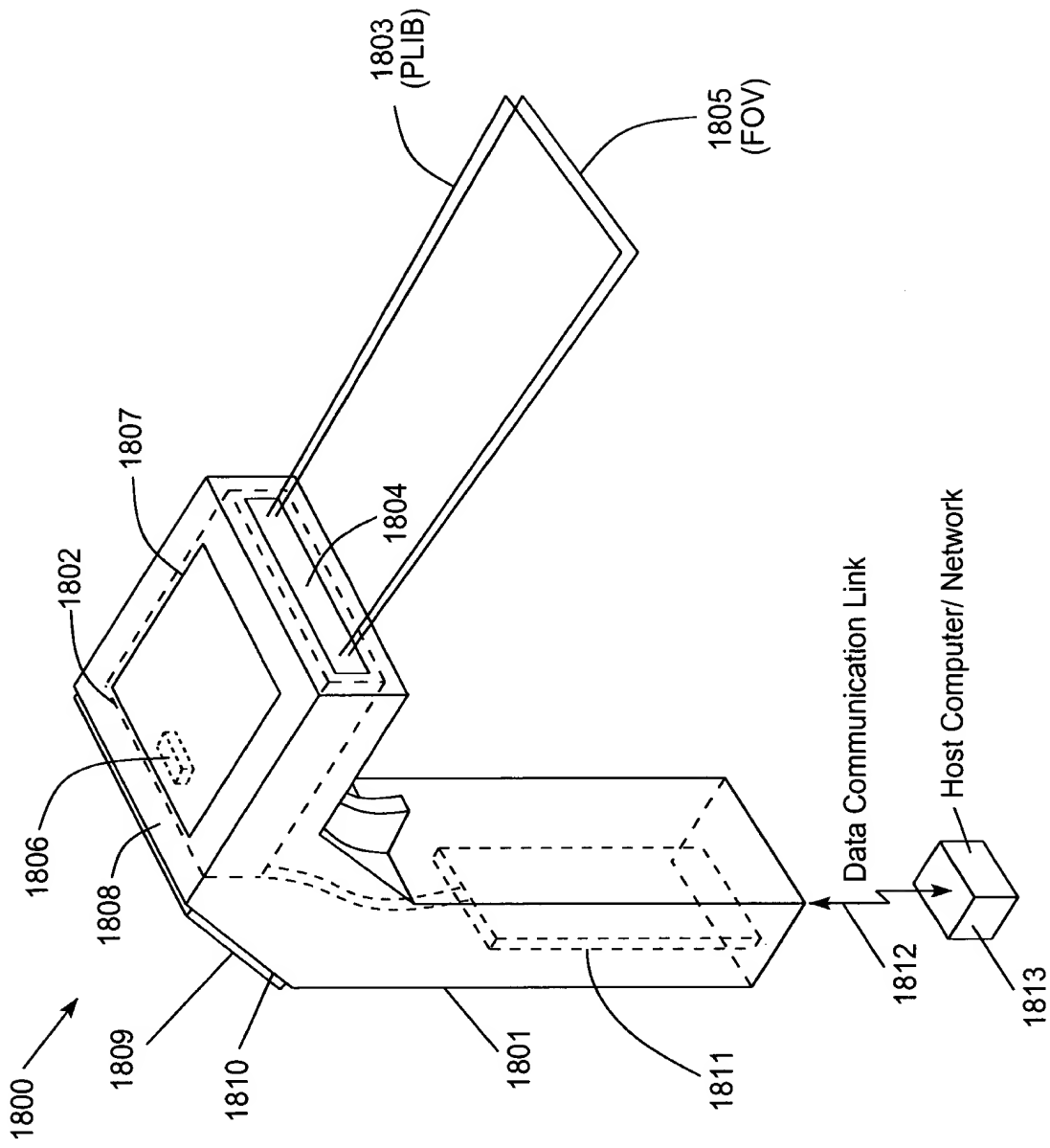


FIG. 51A



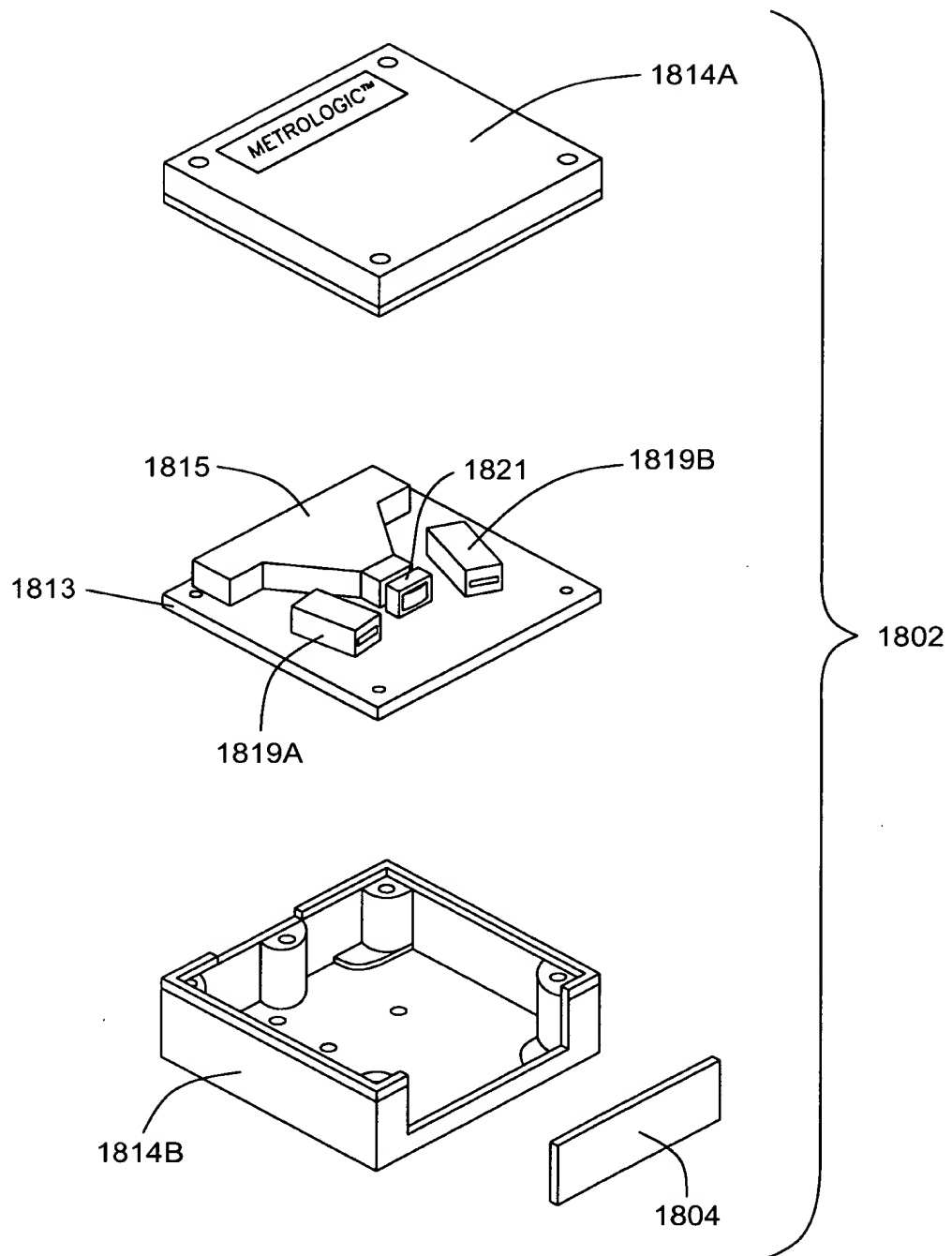


FIG. 51B

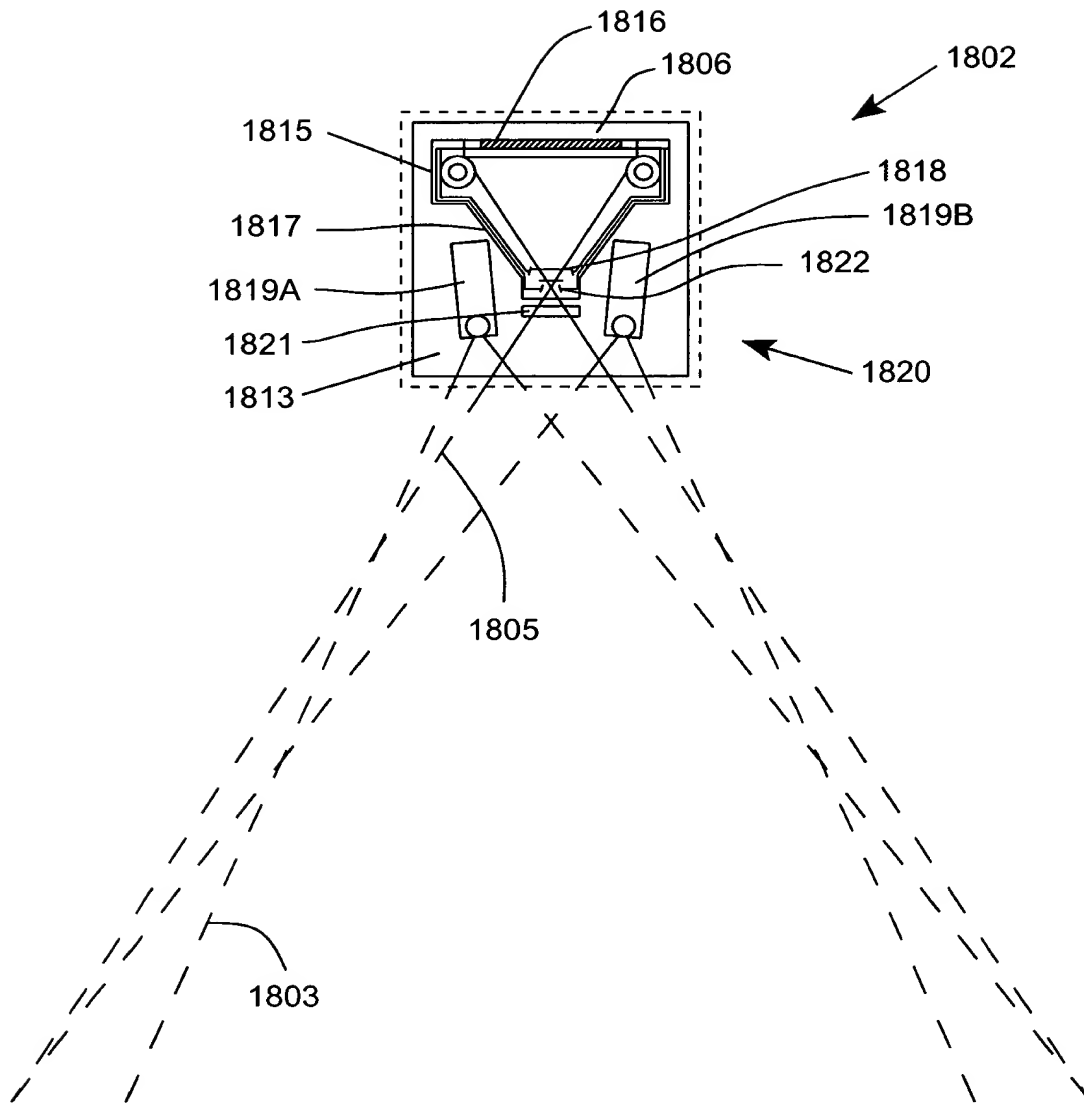


FIG. 51C

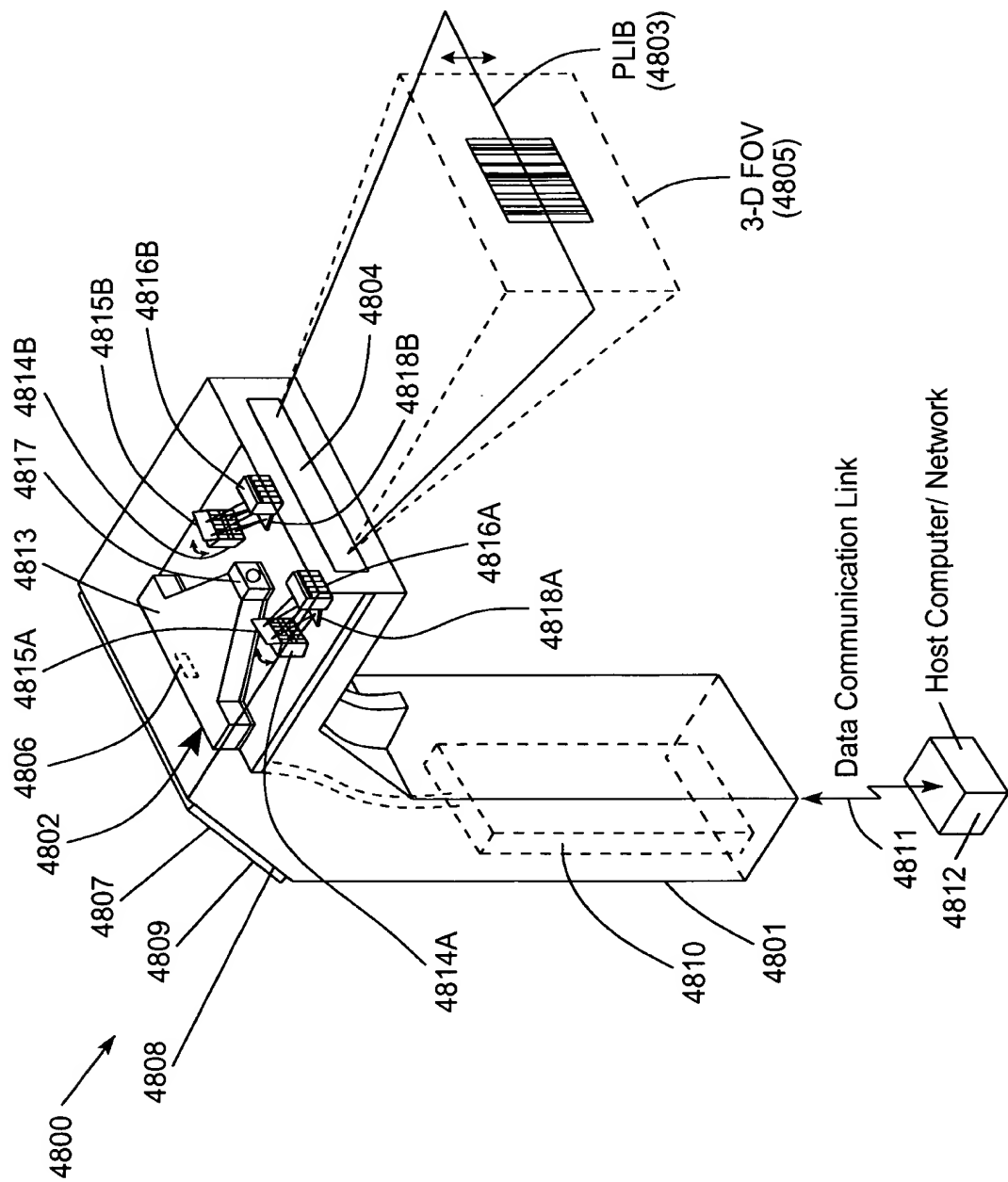


FIG. 52

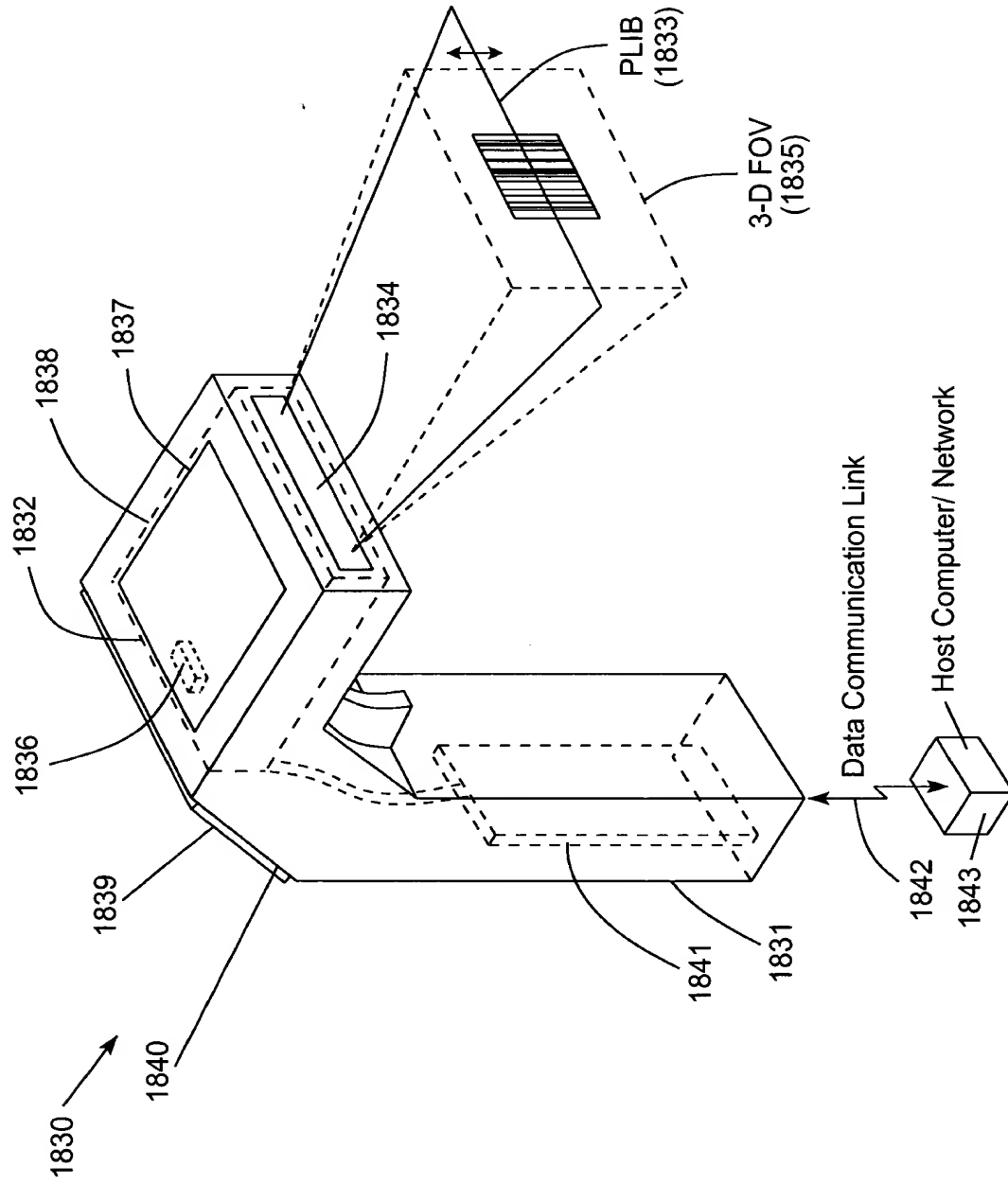


FIG. 52A

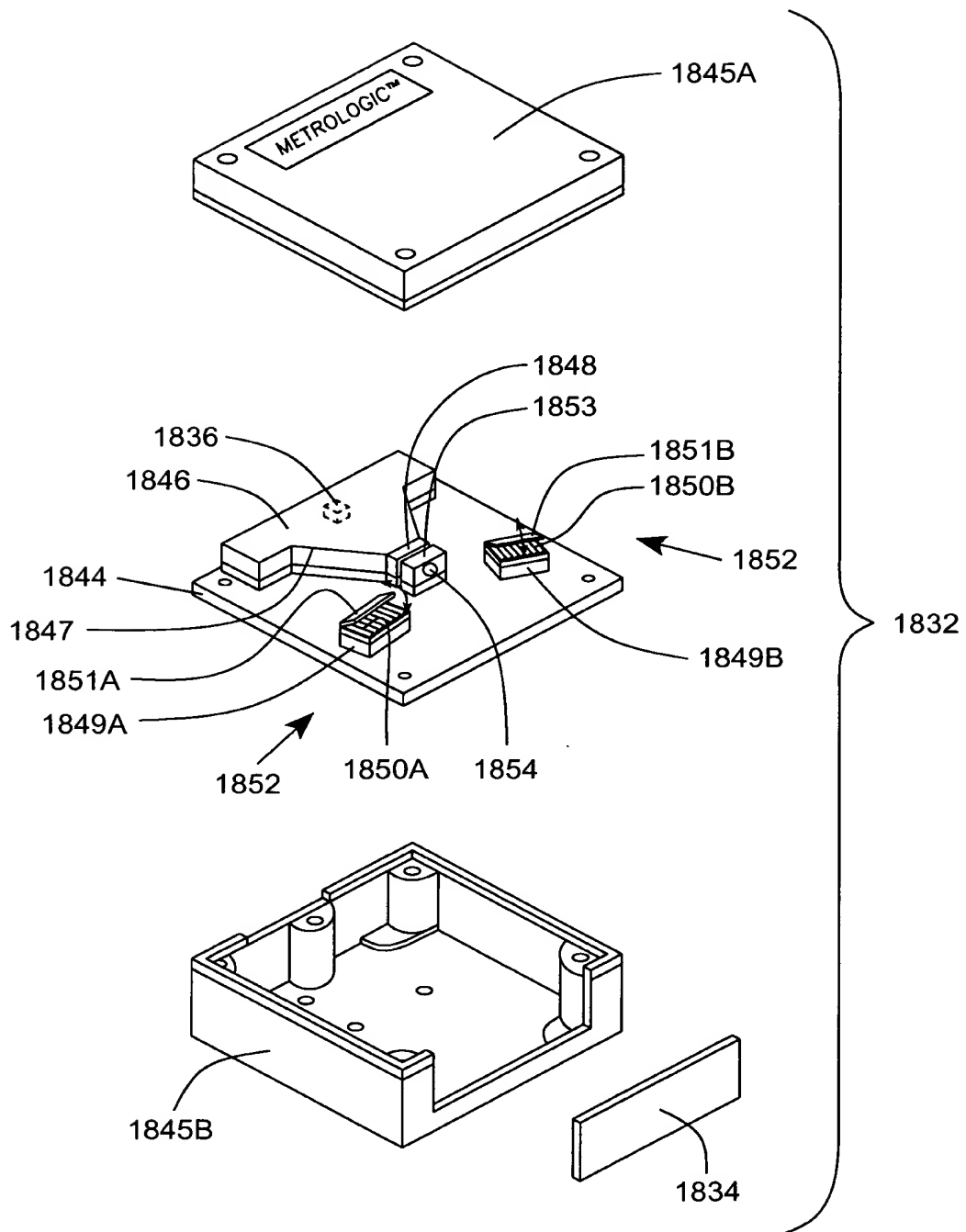


Fig. 113A-3B

FIG. 52B

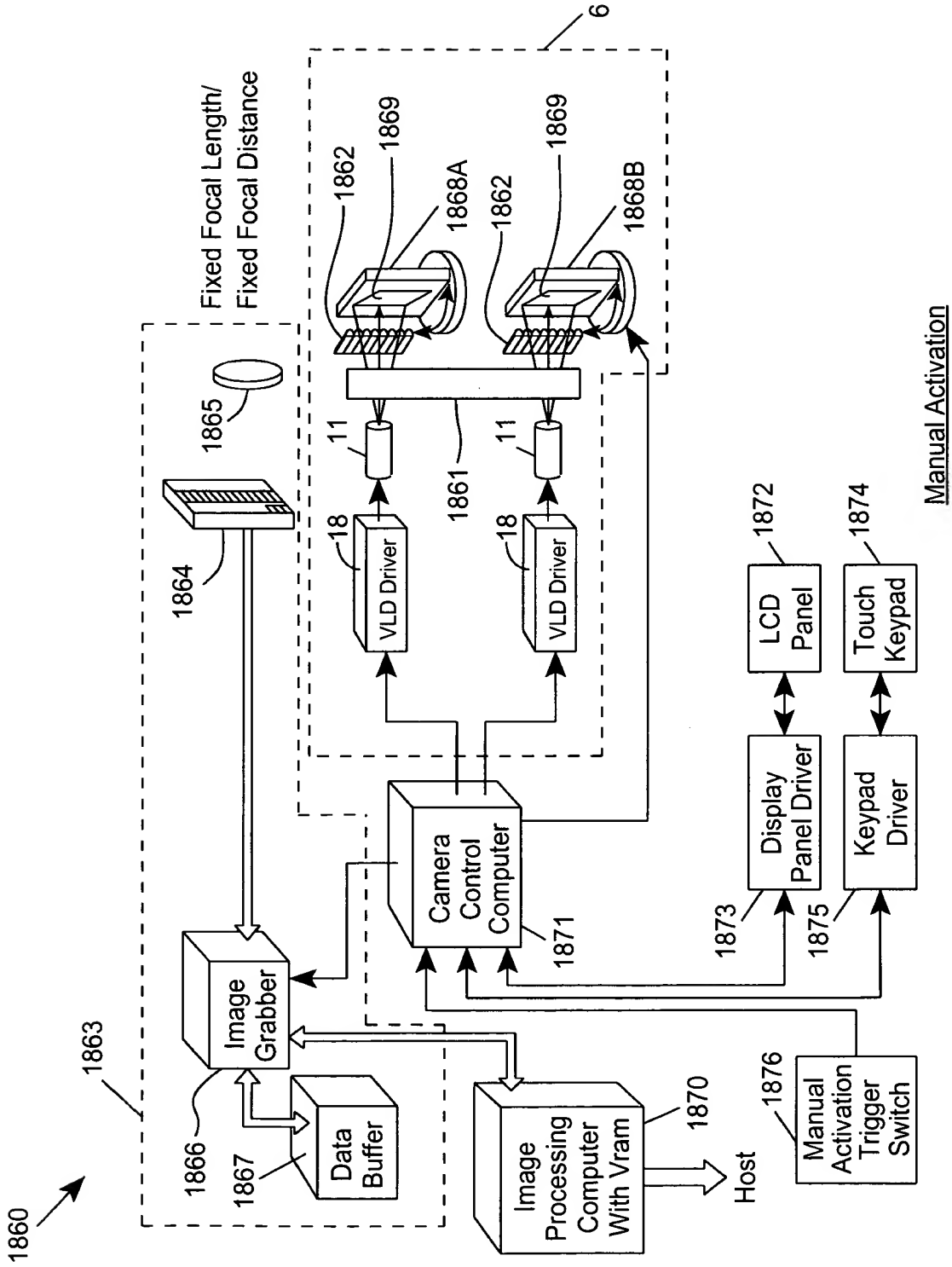


FIG. 53A1

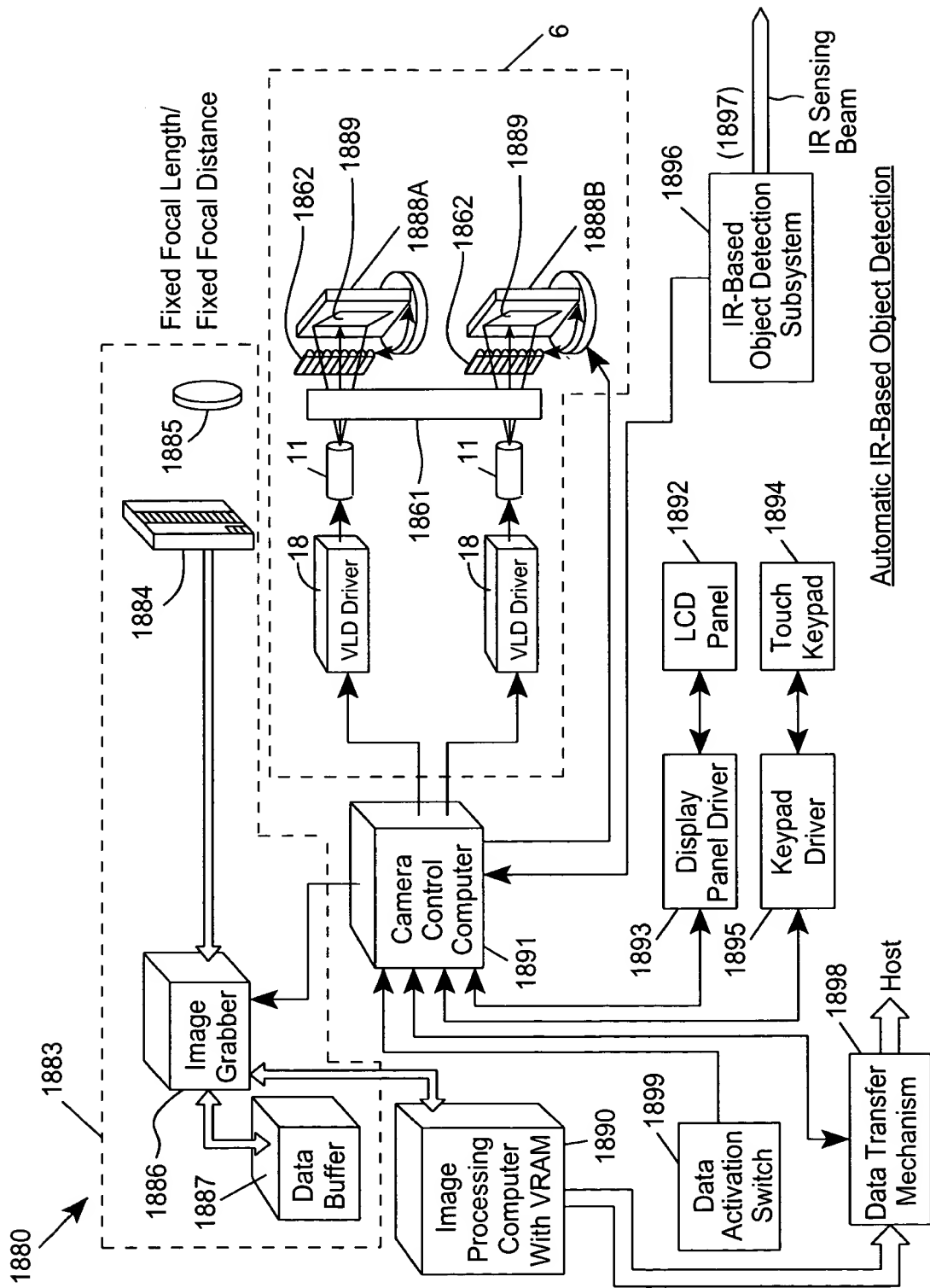
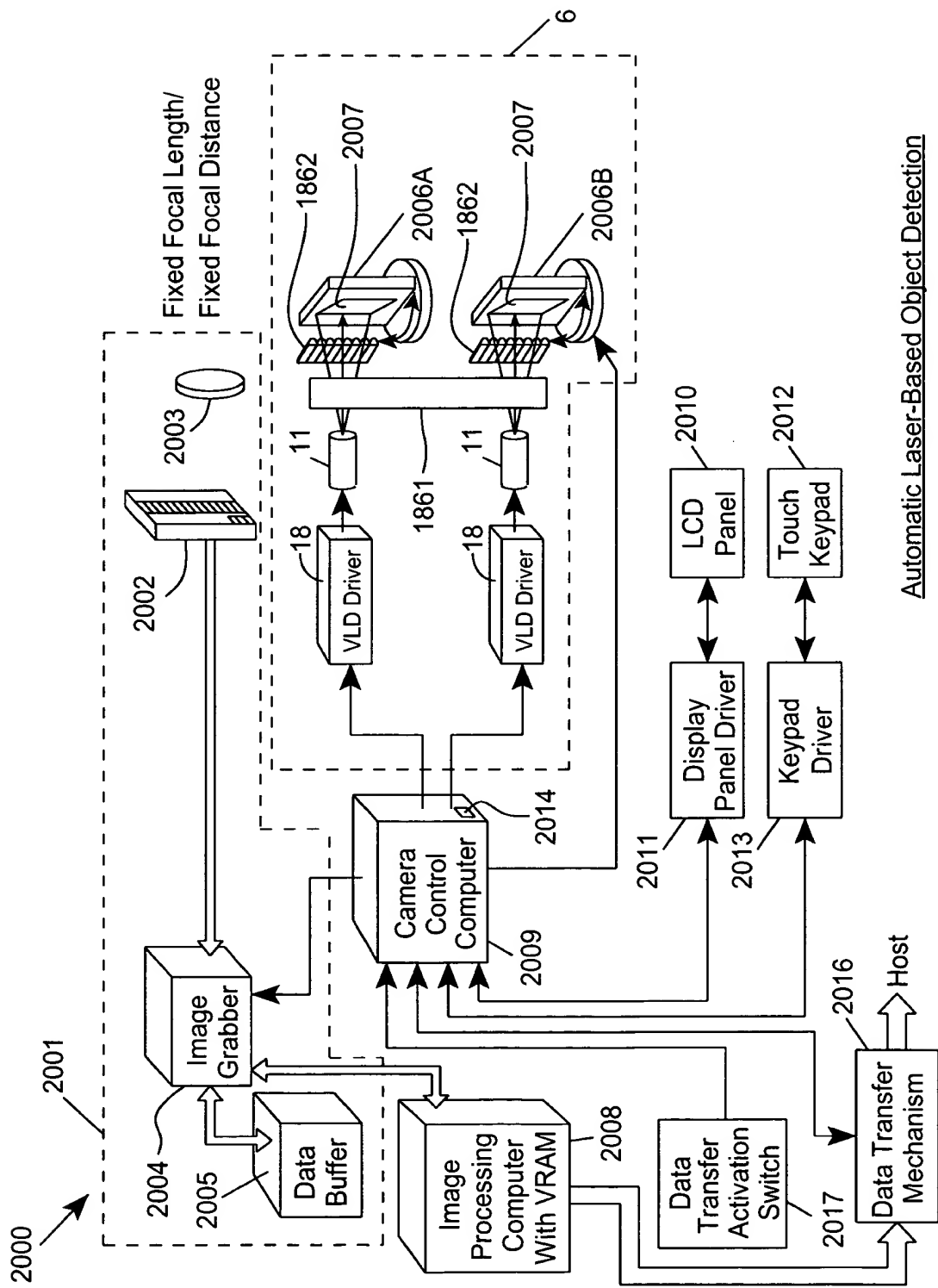


FIG. 53A2



Automatic Laser-Based Object Detection

FIG. 53A3



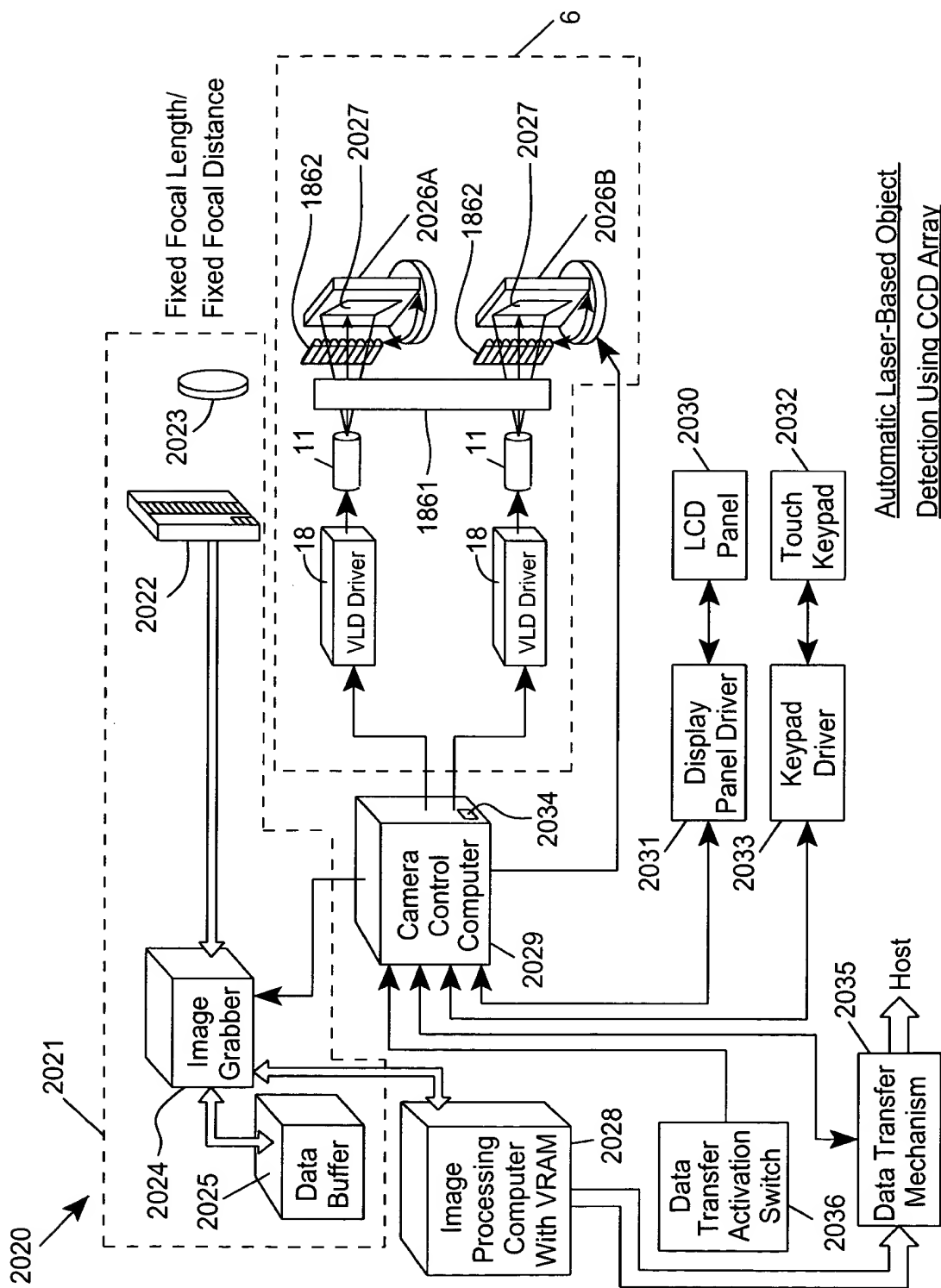
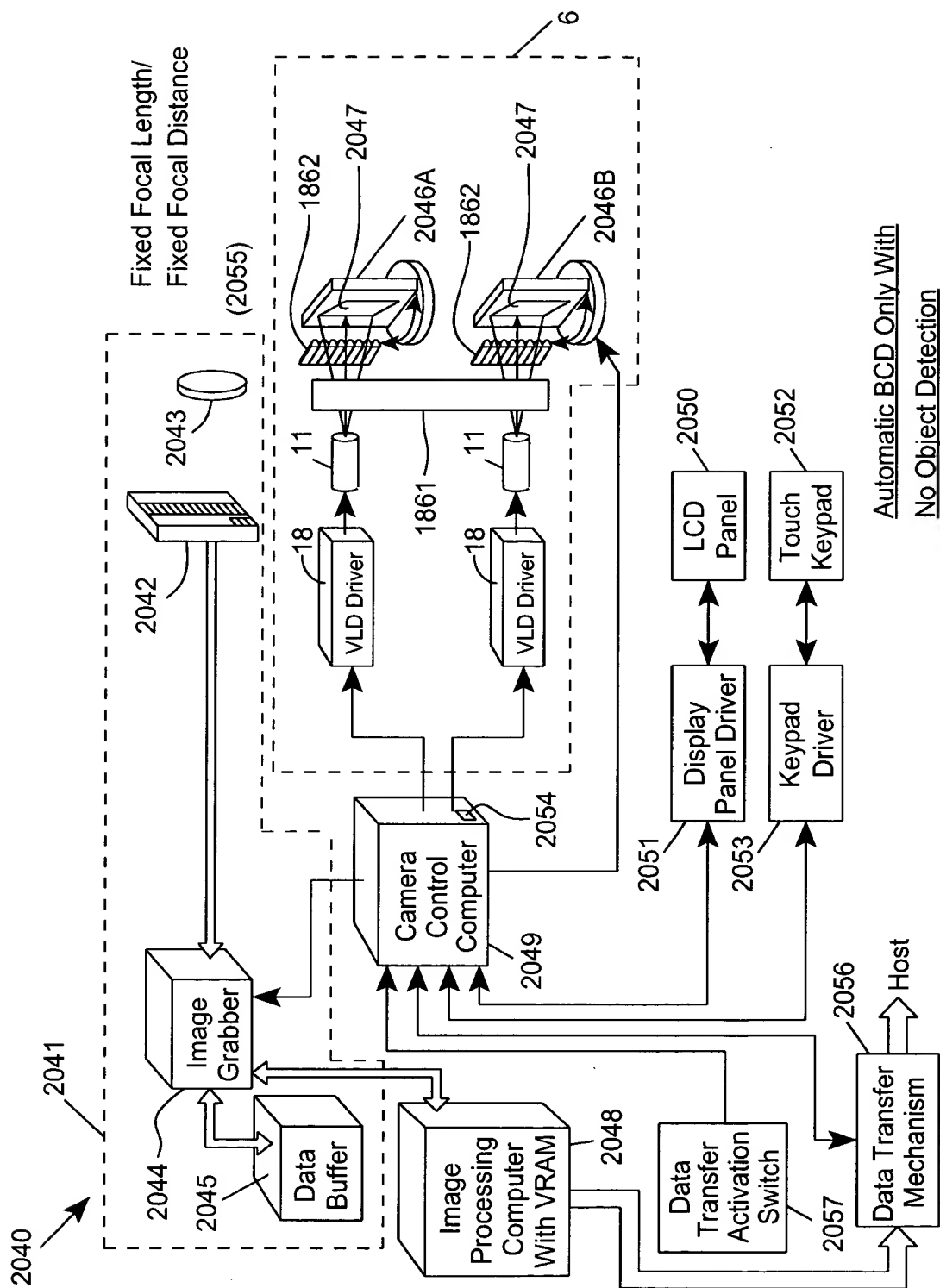
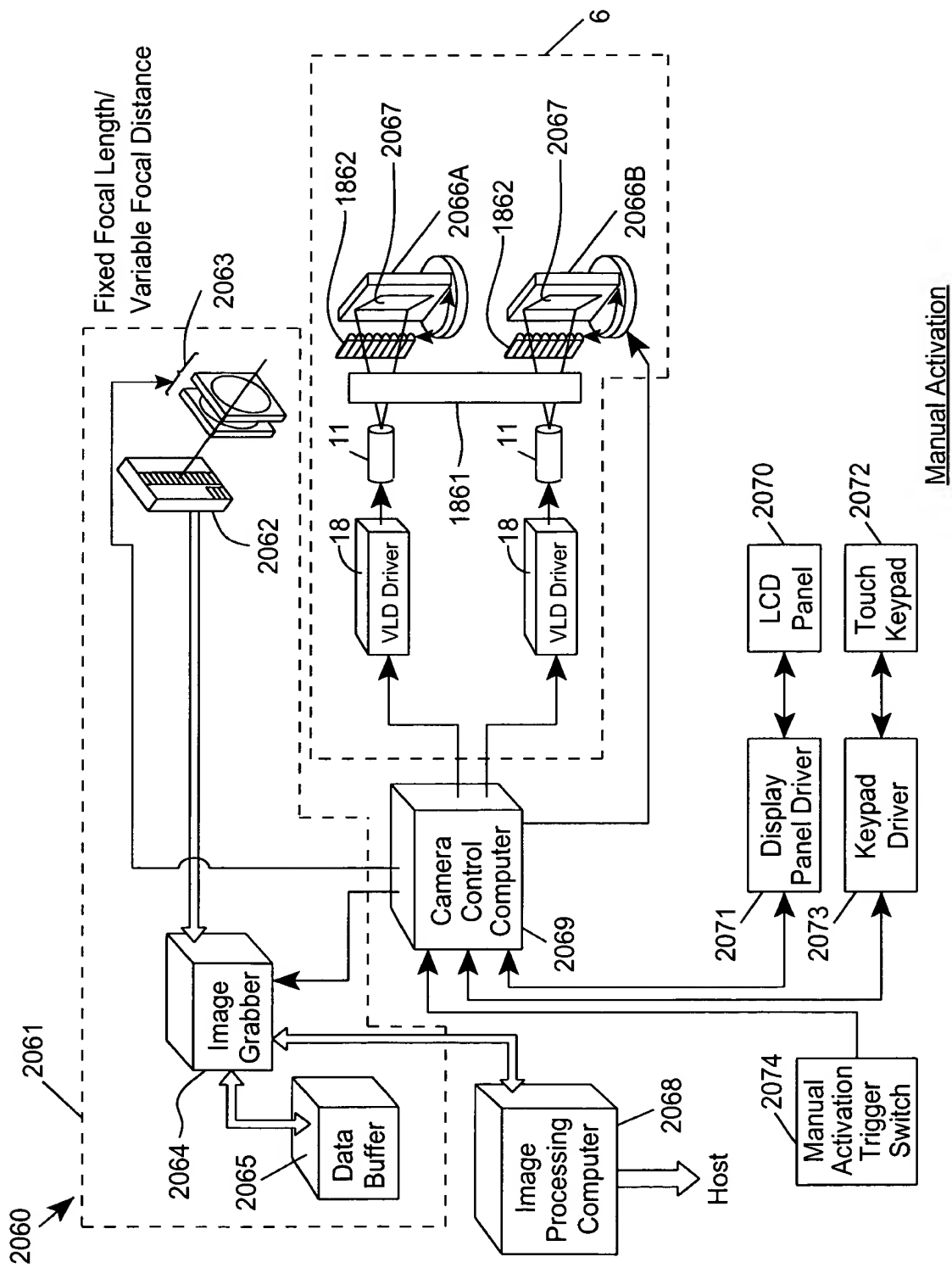


FIG. 53A4



**FIG. 53A5**



**FIG. 53B1**

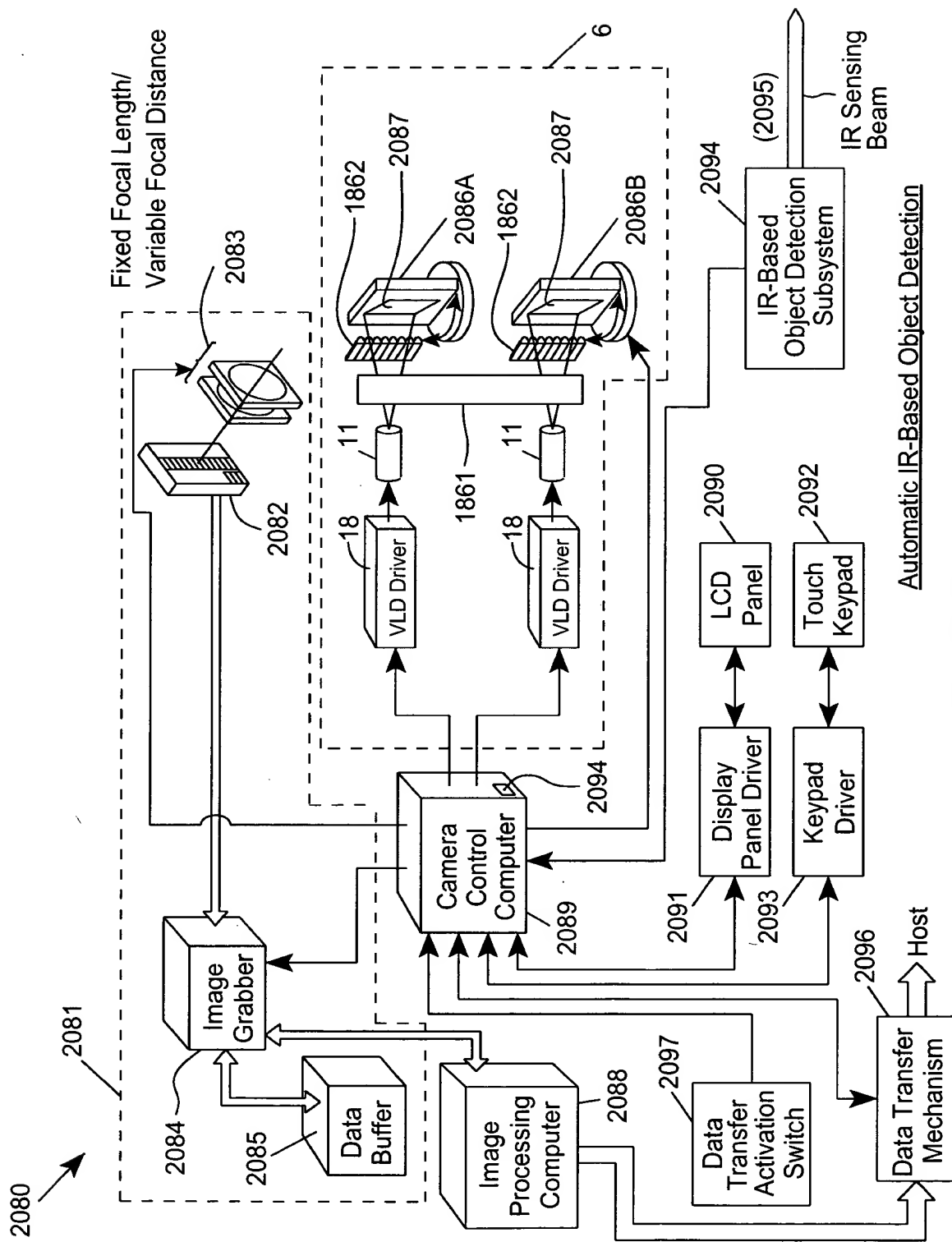
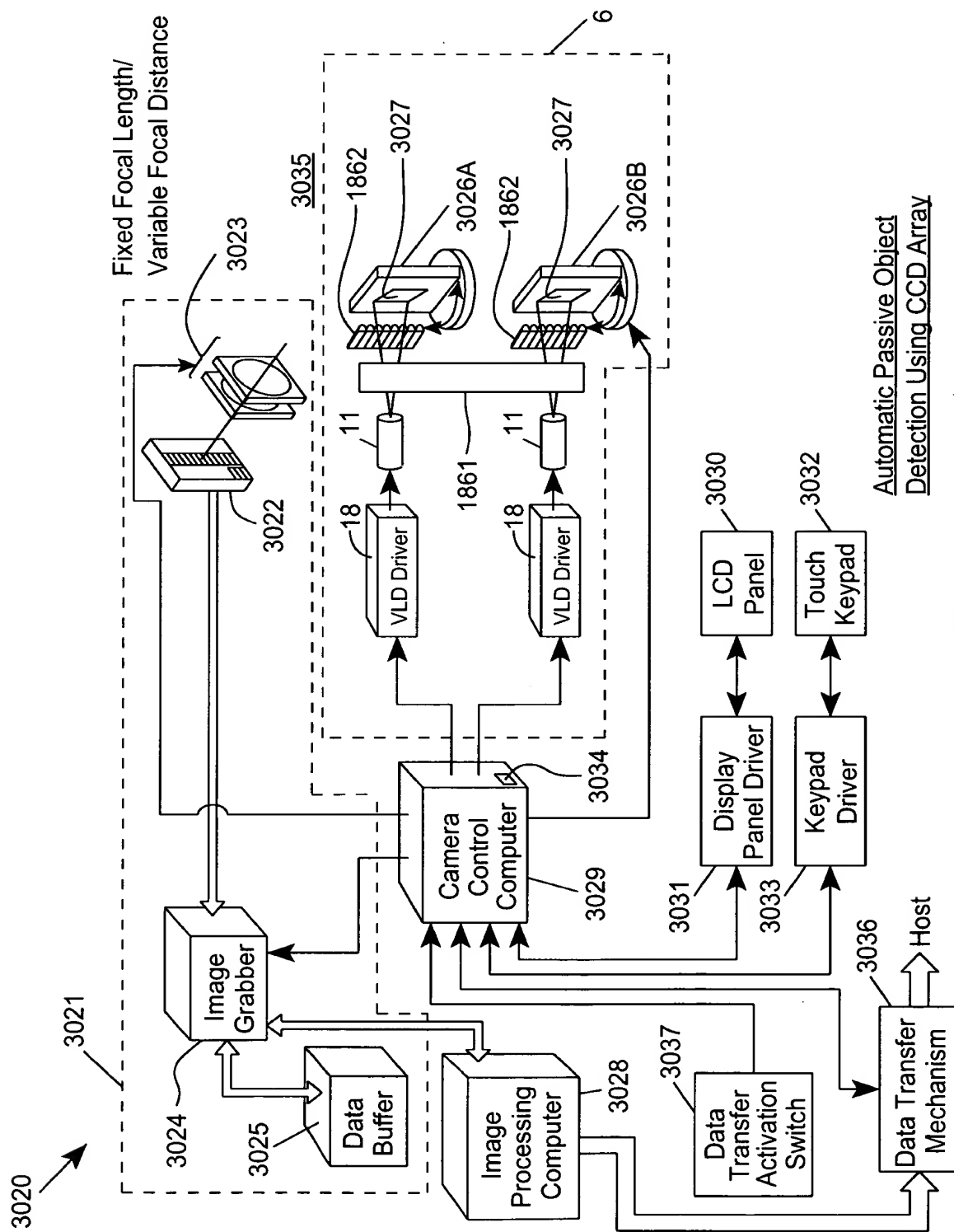
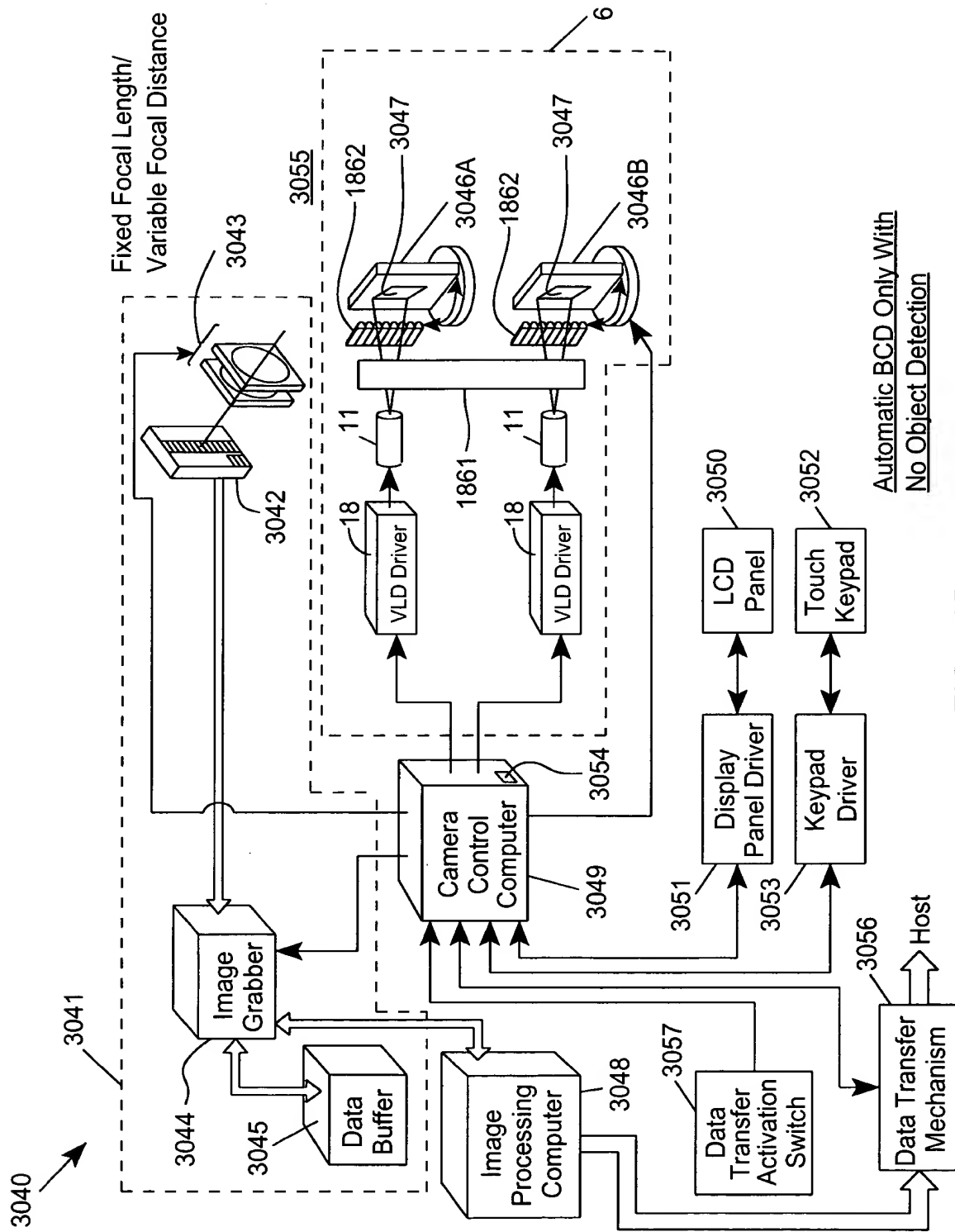


FIG. 53B2







Automatic BCD Only With  
 No Object Detection

FIG. 53B5

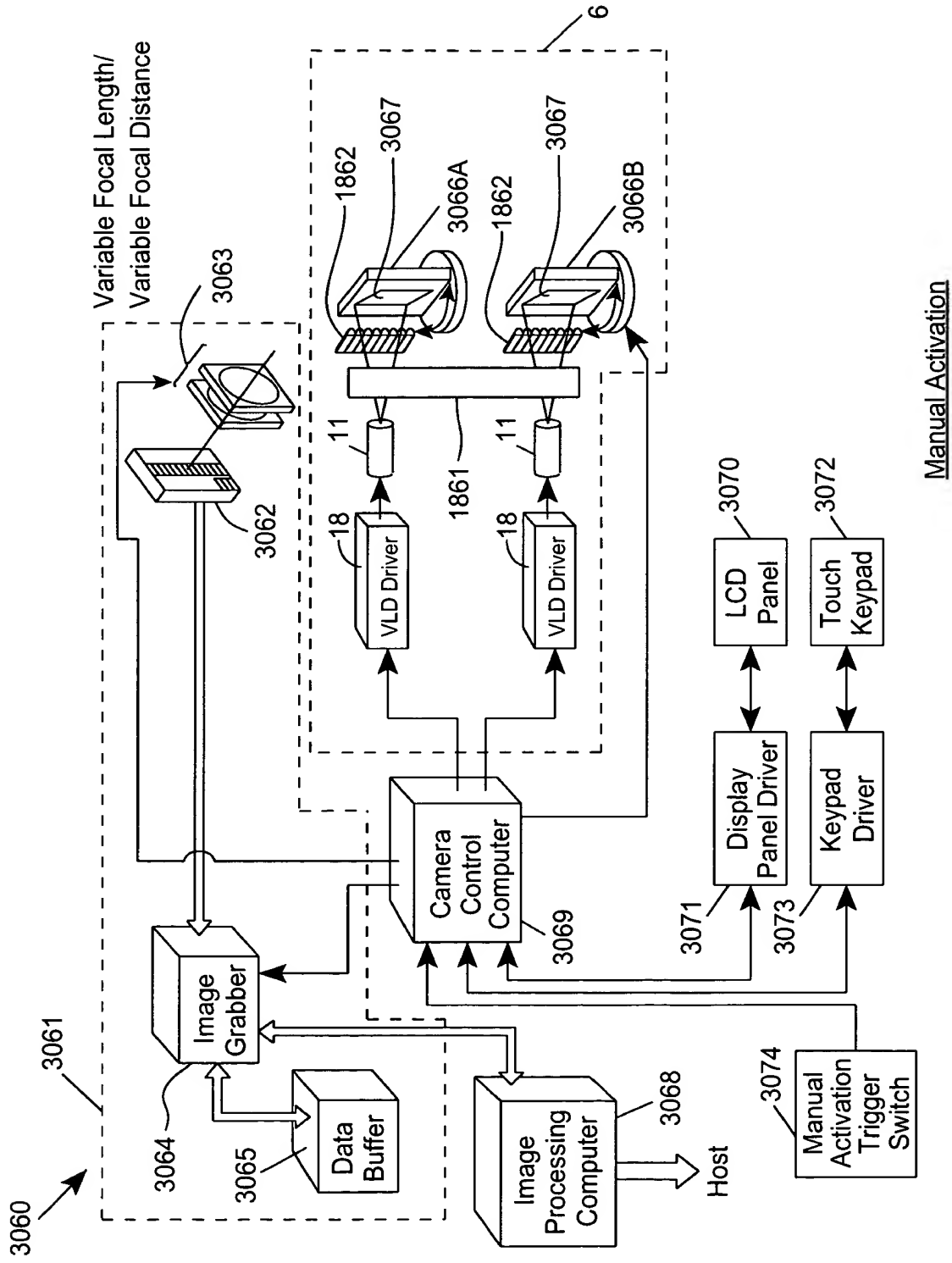


FIG. 53C1

Manual Activation



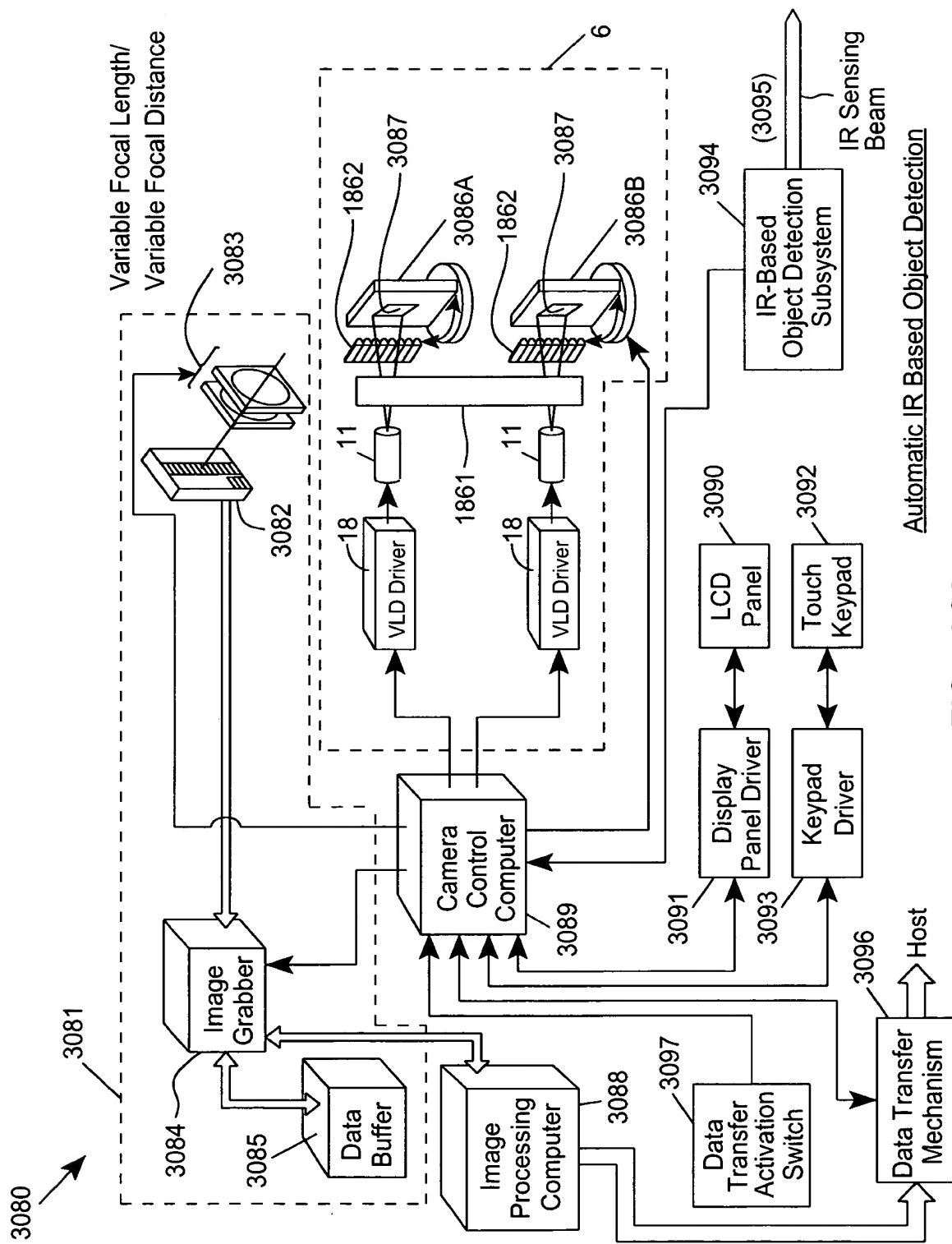


FIG. 53C2

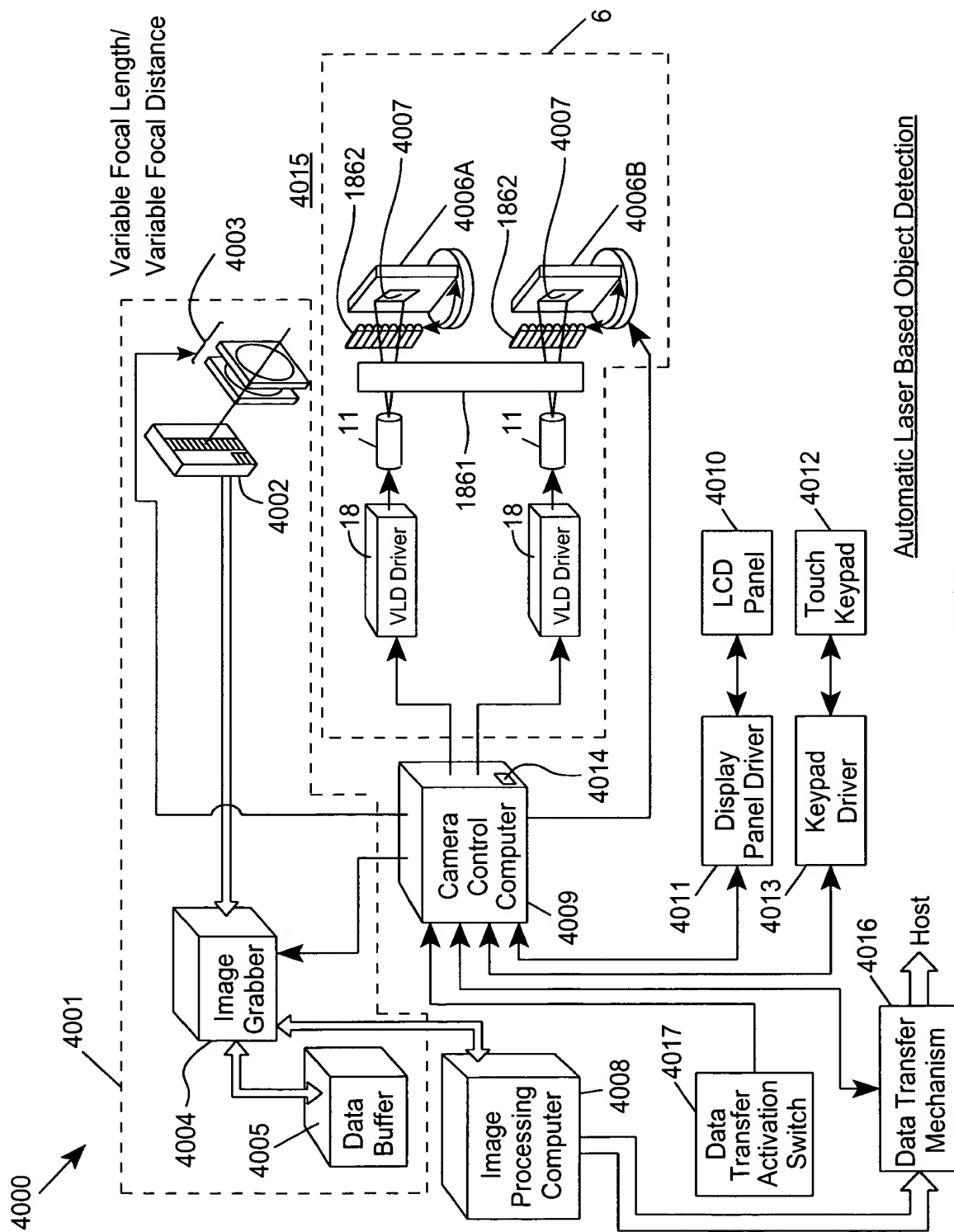


FIG. 53C3

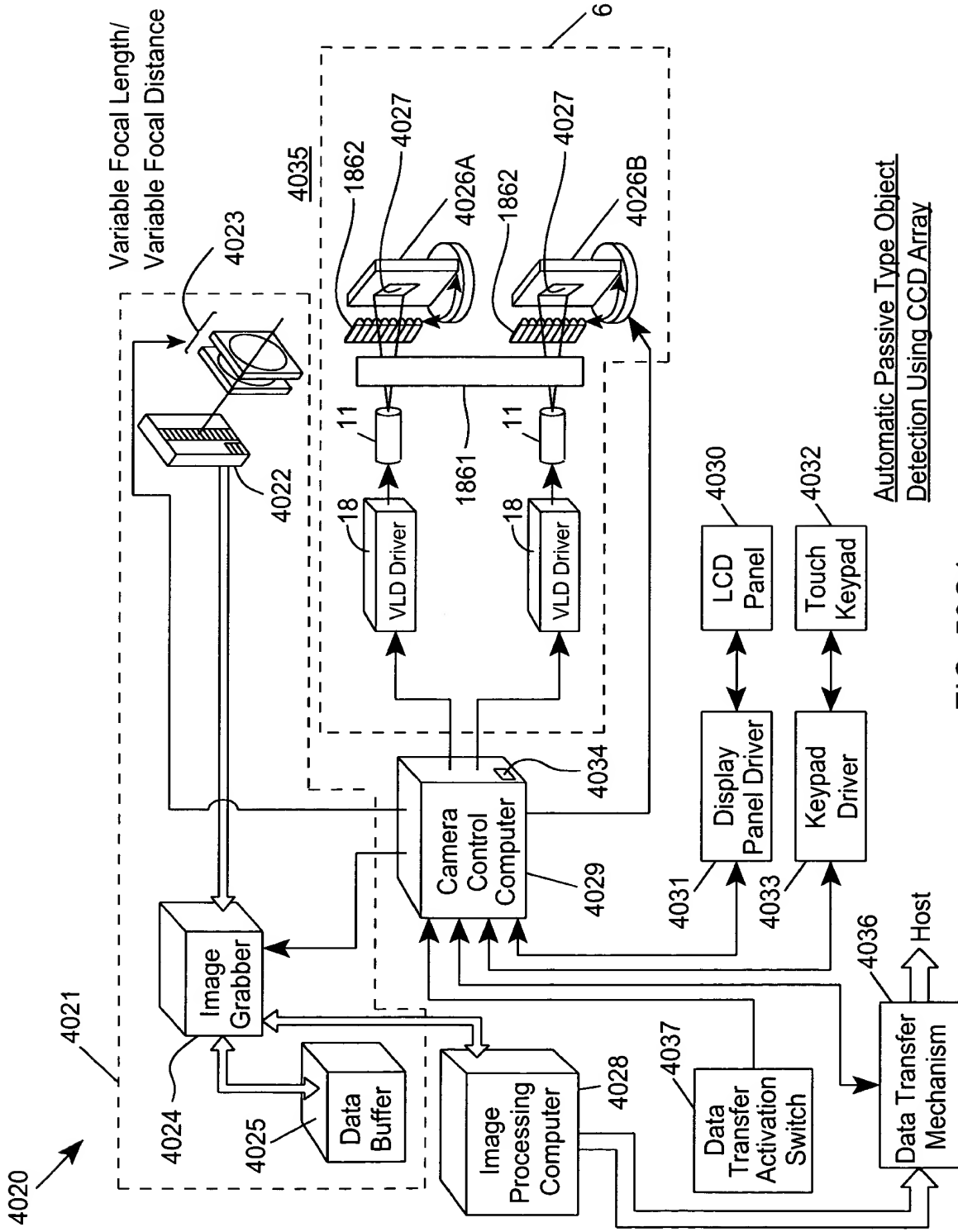
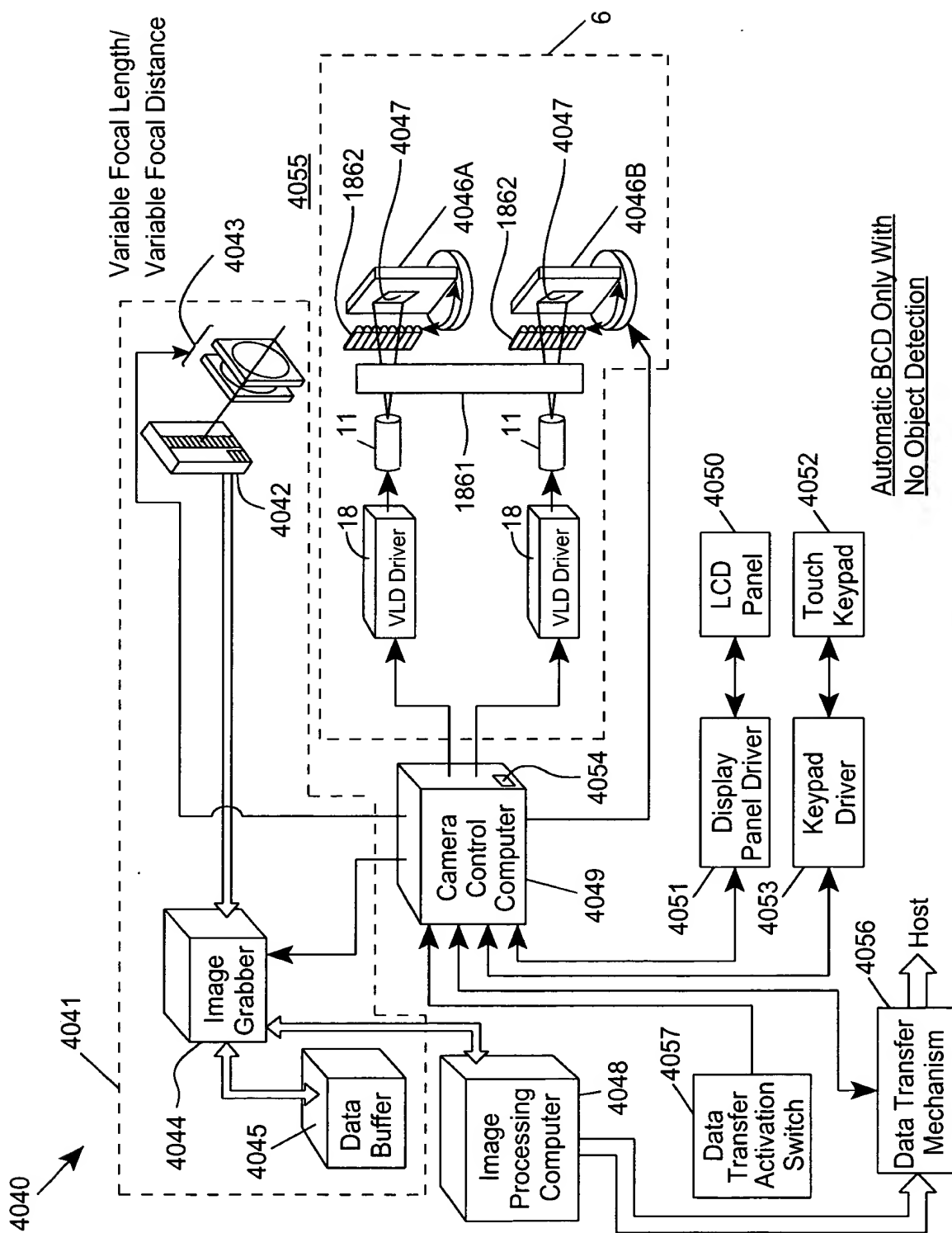


FIG. 53C4



**FIG. 53C5**

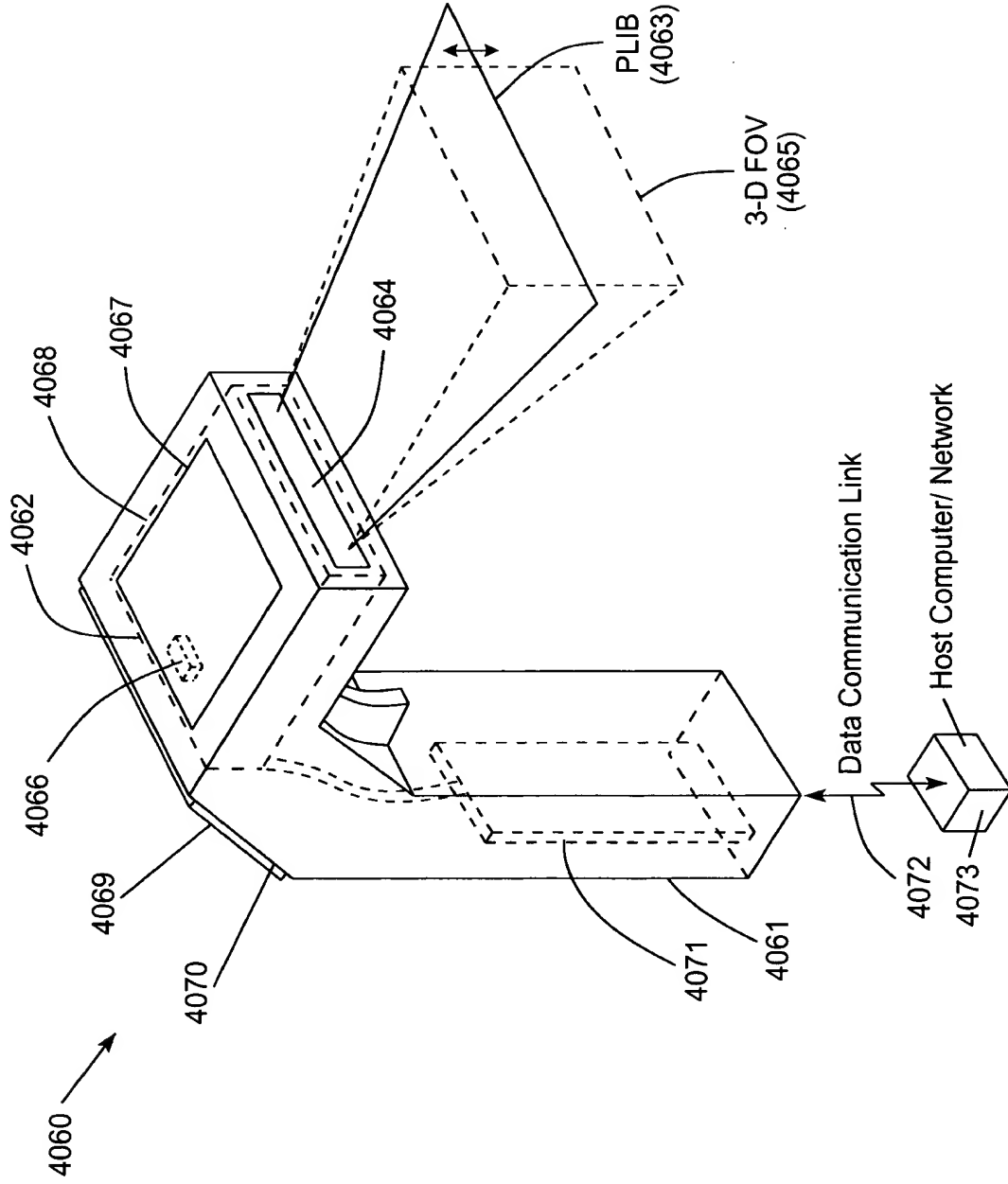
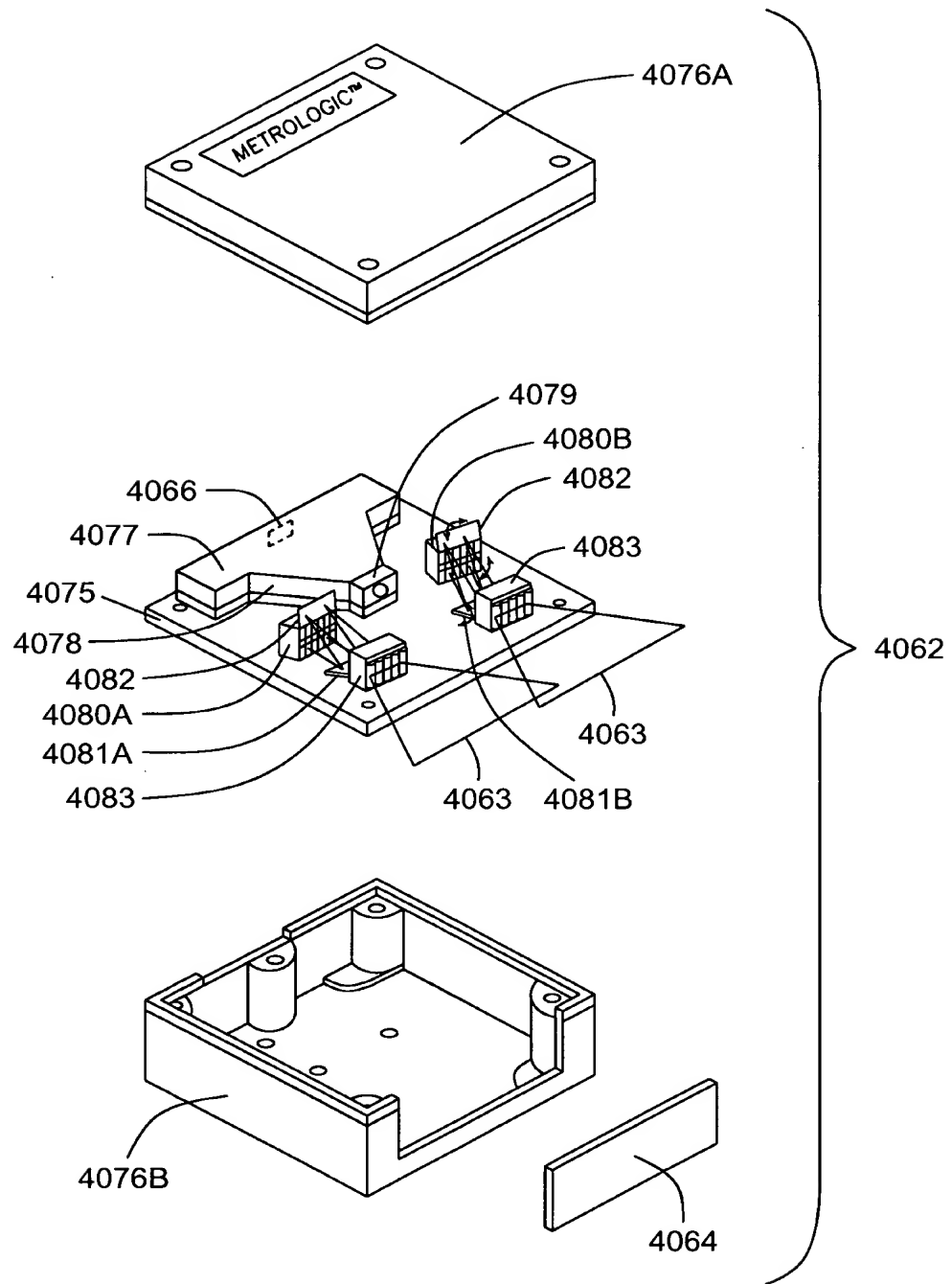


FIG. 54A



(Dual Mirrors)  
Fig. 115A-5D

FIG. 54B

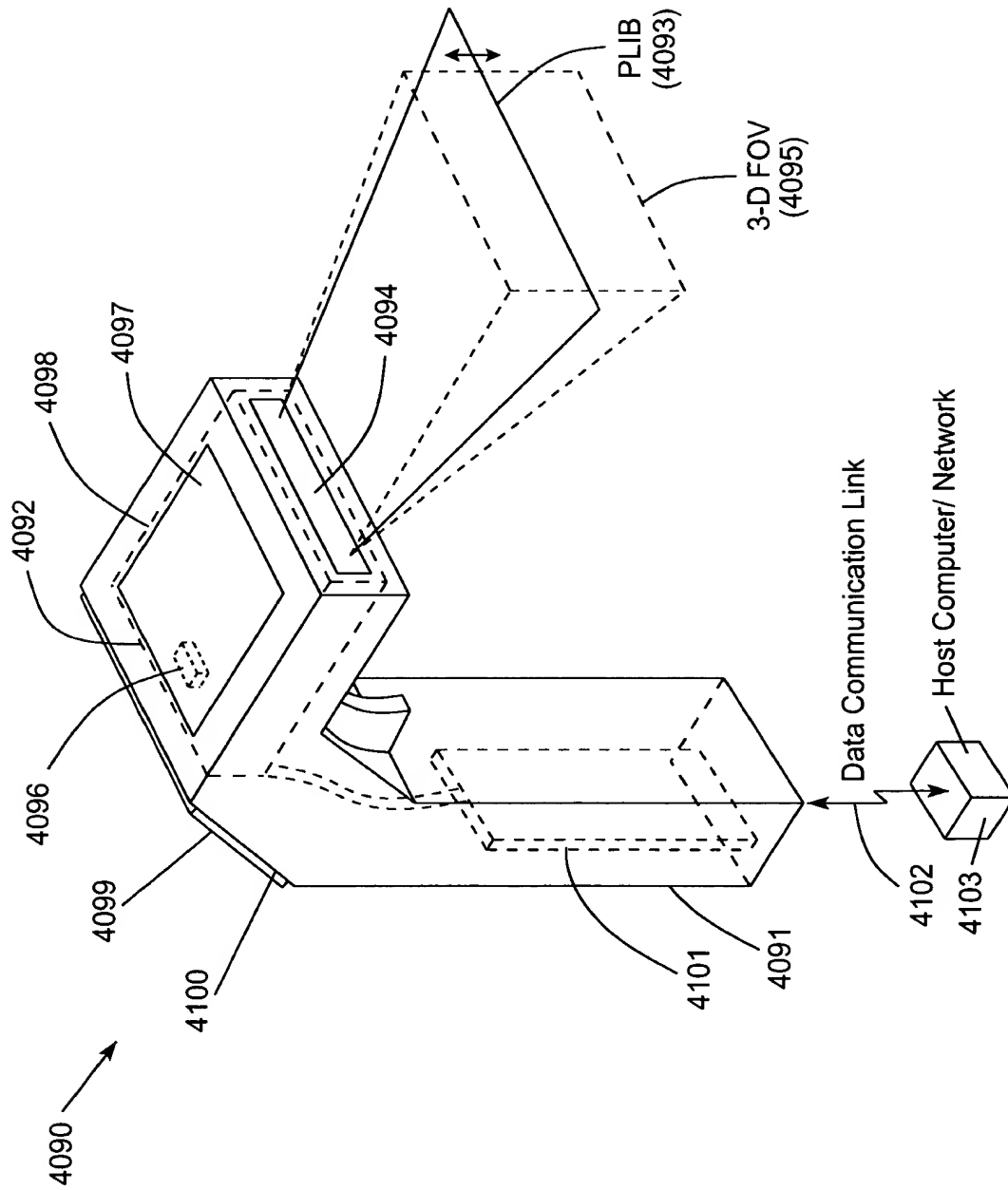
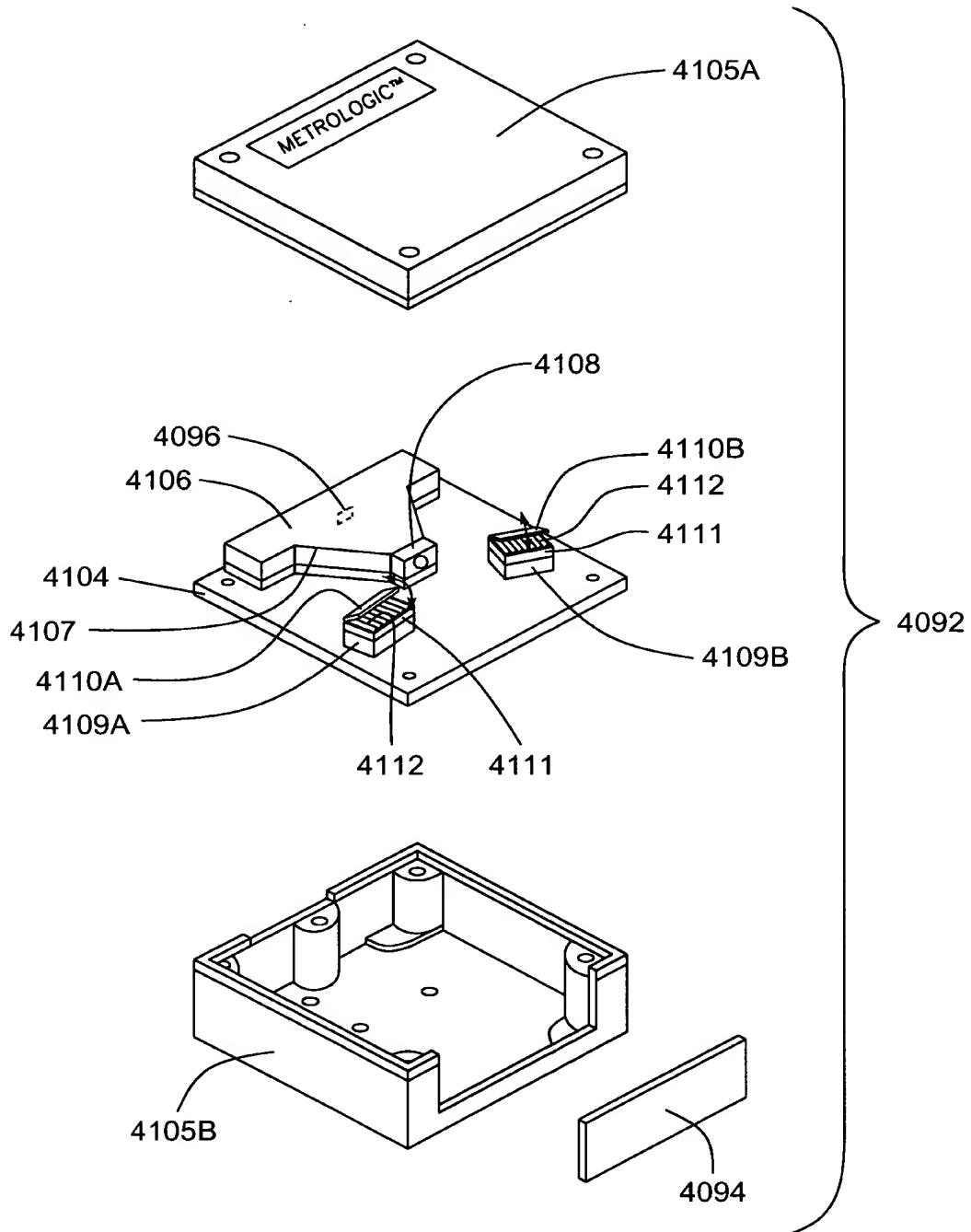


FIG. 55A



Bragg Cell  
Fig. 116A-6B

FIG. 55B



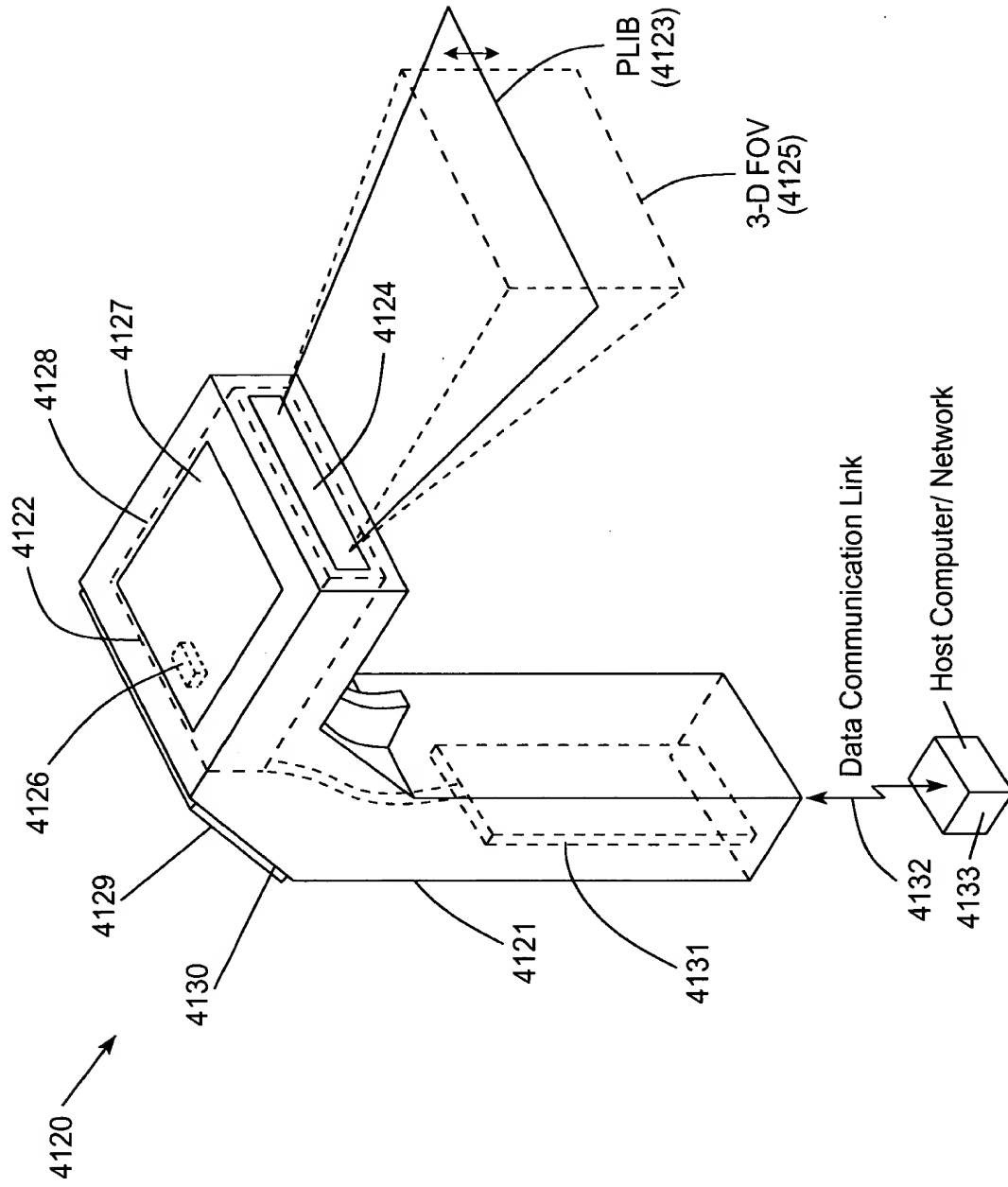
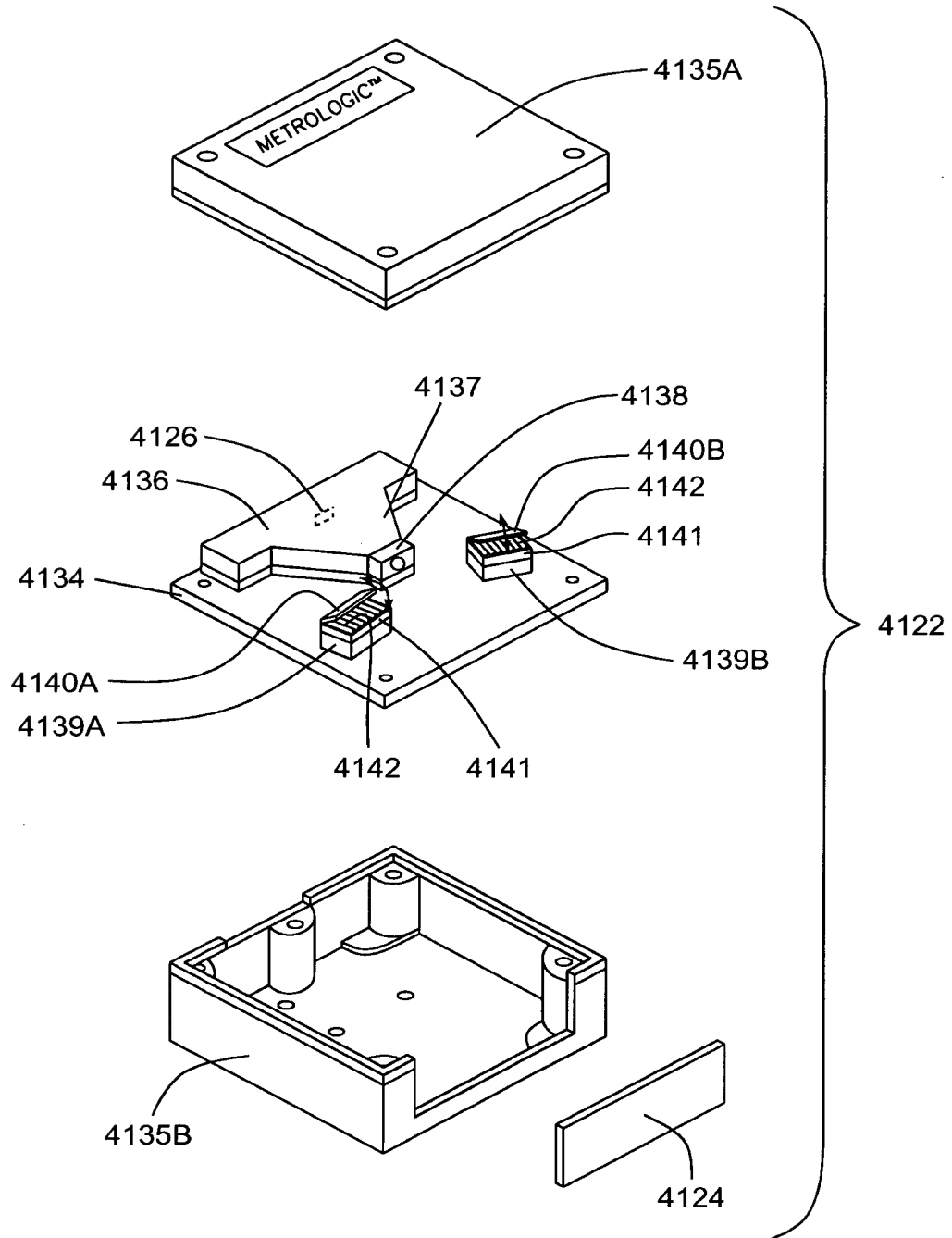


FIG. 56A



DM  
Fig. 117A-7B

FIG. 56B

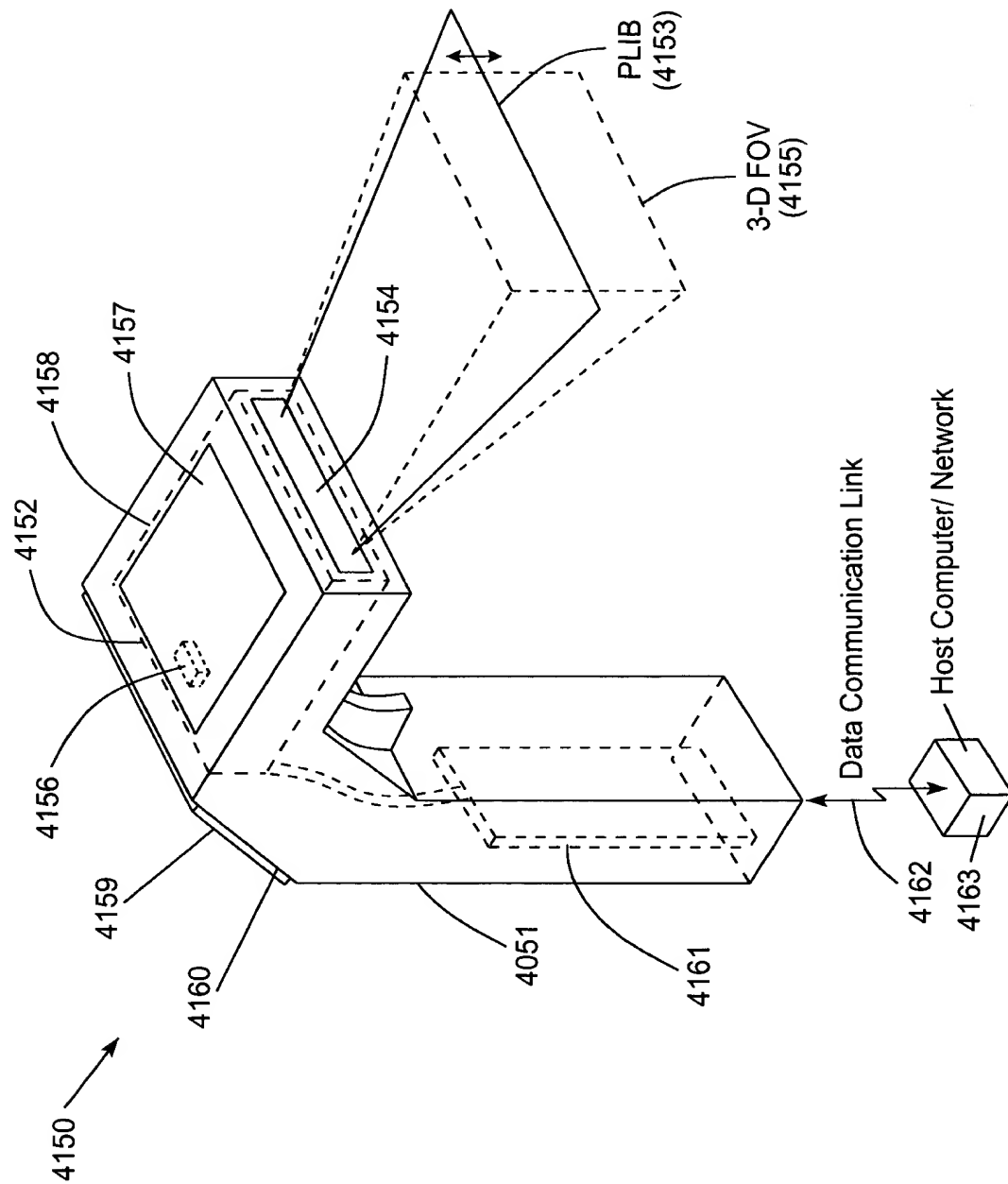
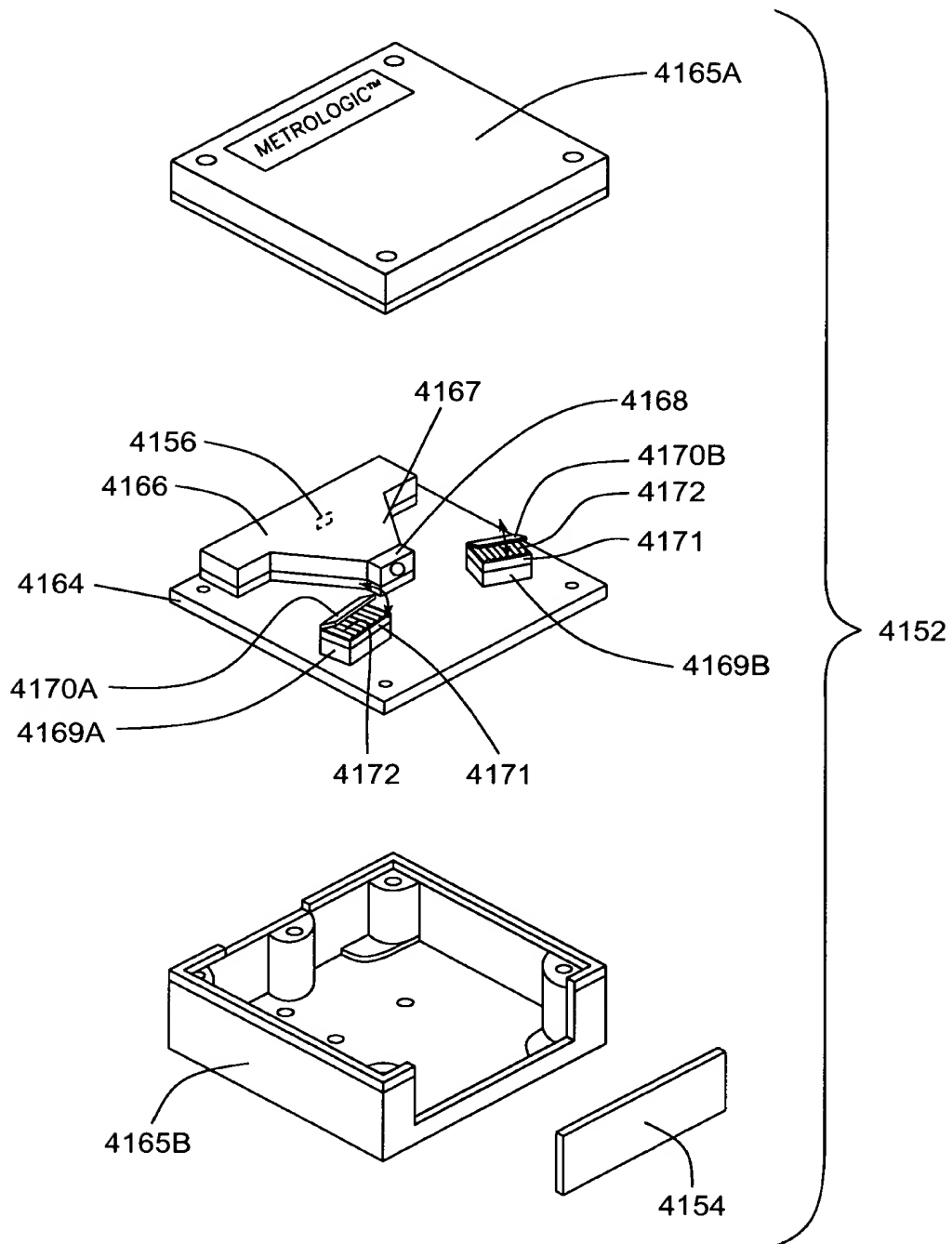


FIG. 57A



Phase Only LCD  
PM Panel  
Fig. 1I8F-8G

FIG. 57B

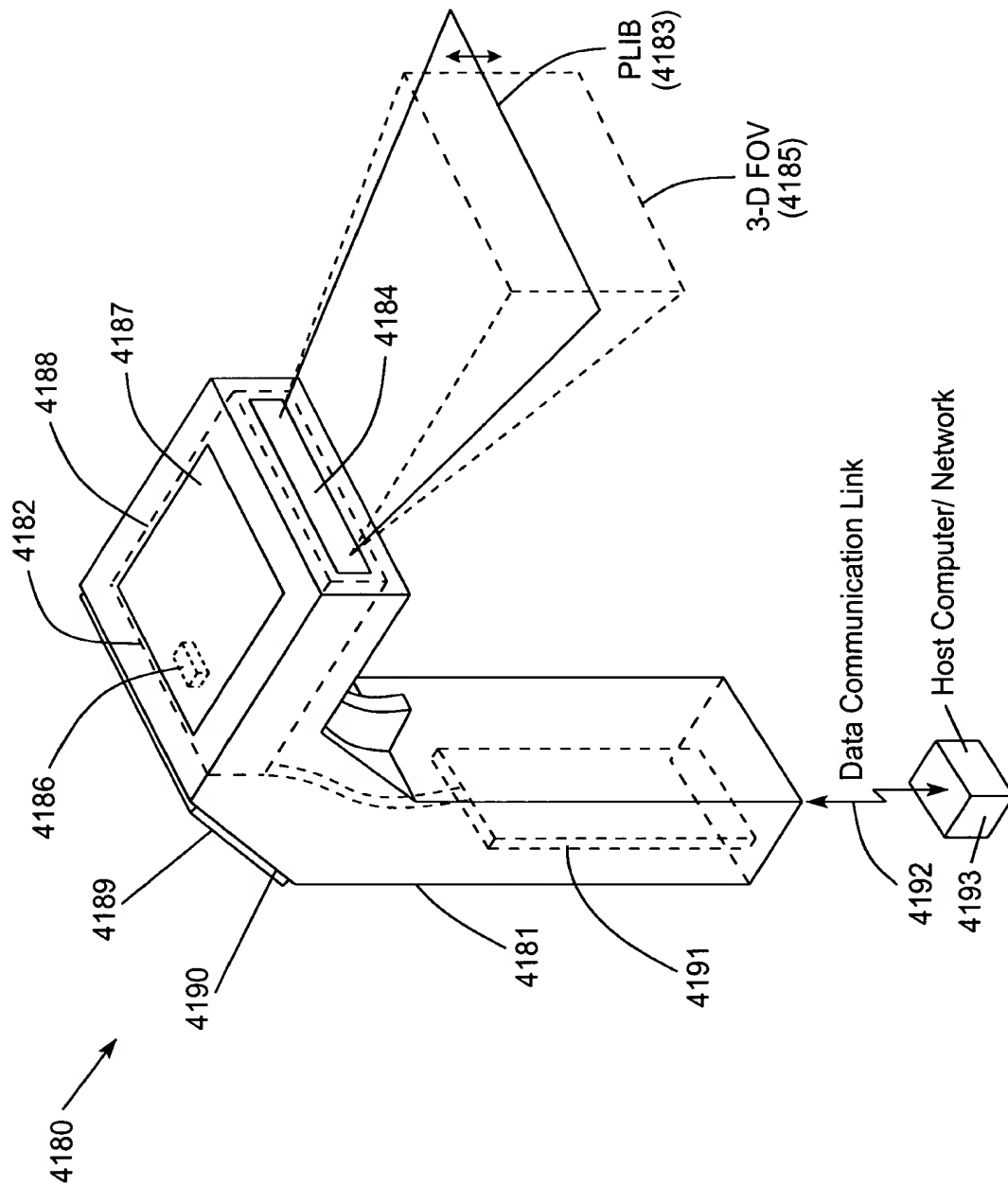
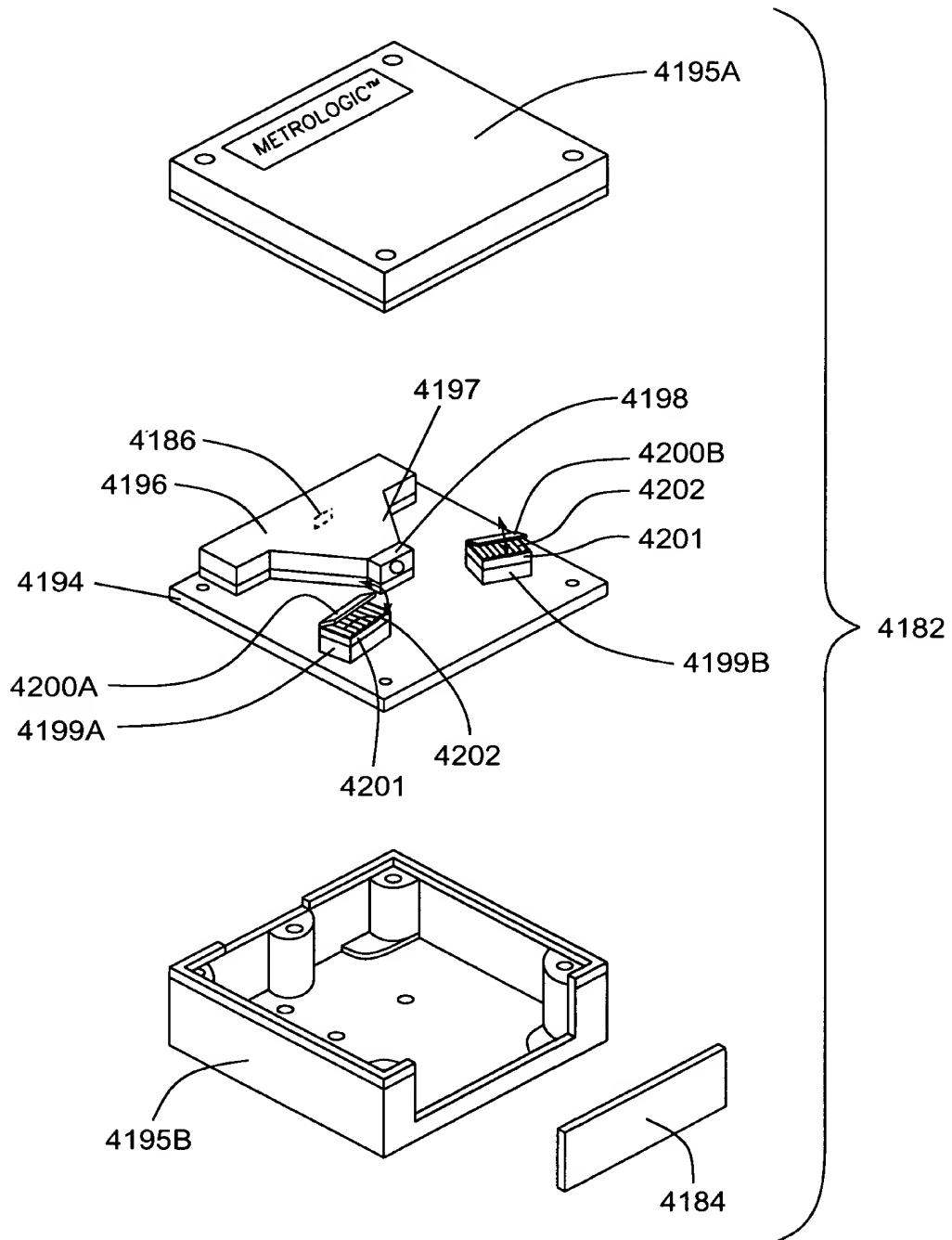


FIG. 58A



HS Optical Shutter  
Fig. 1114A-14B

FIG. 58B

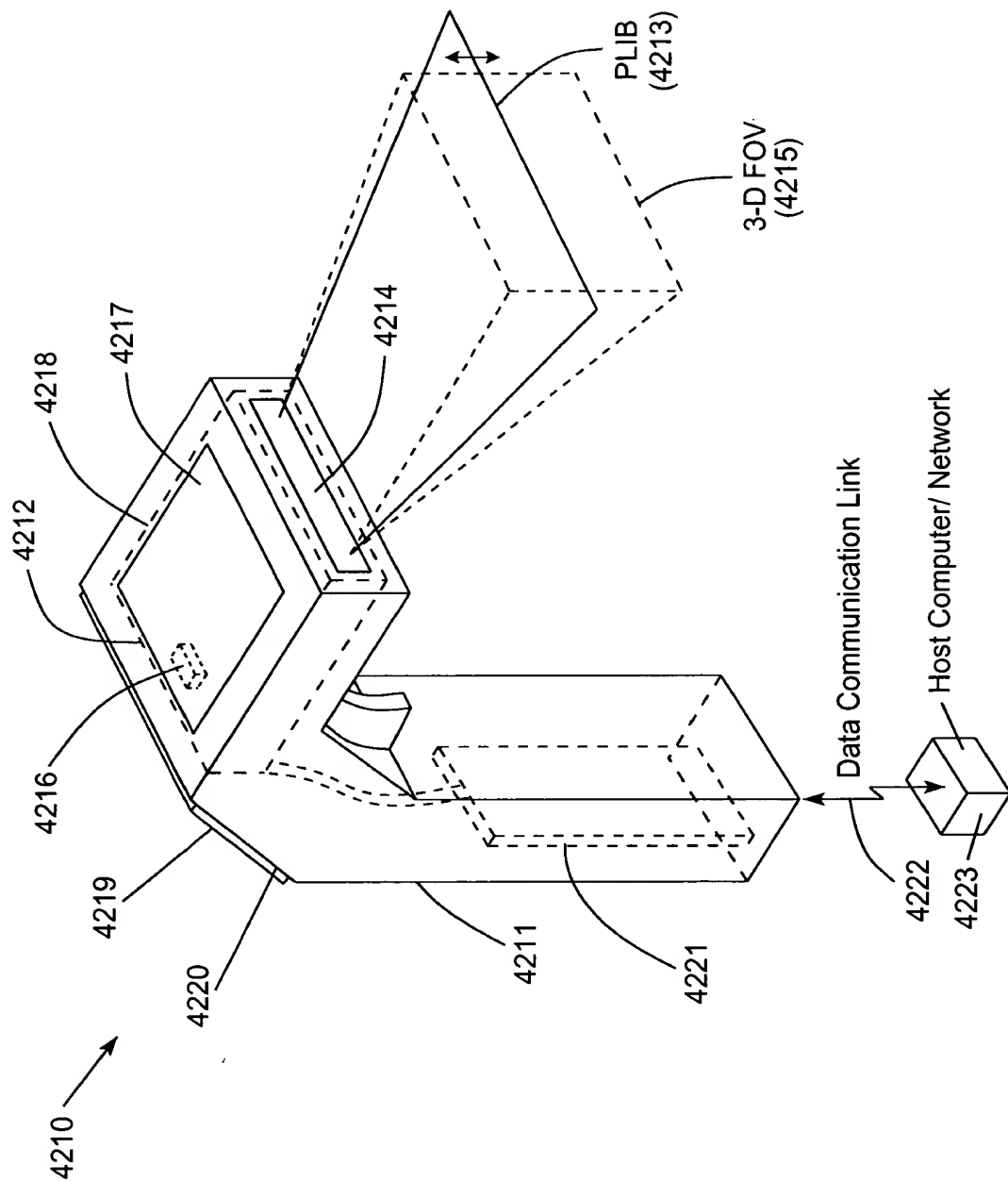
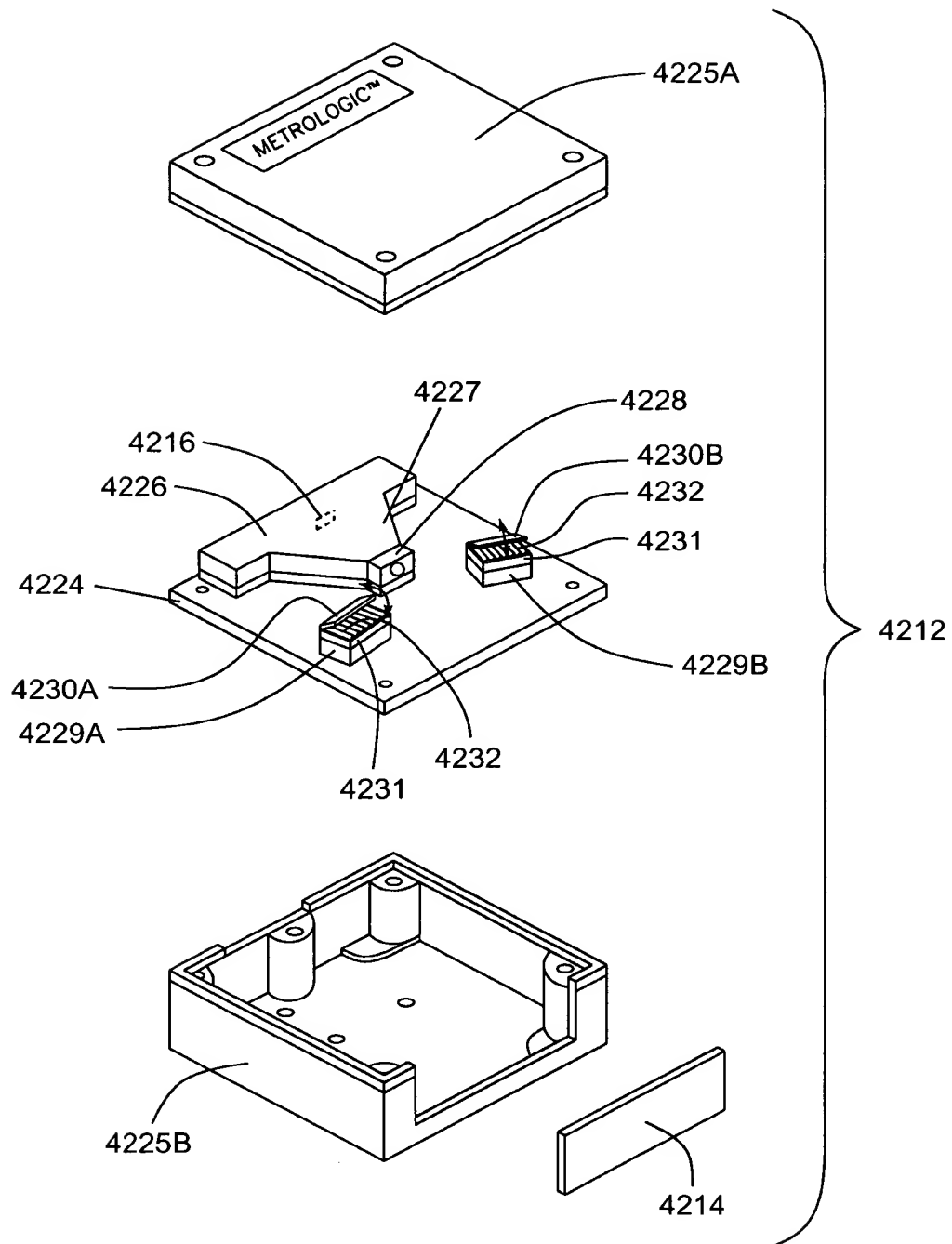


FIG. 59A



MLLD  
Fig. 1115A-15B

FIG. 59B



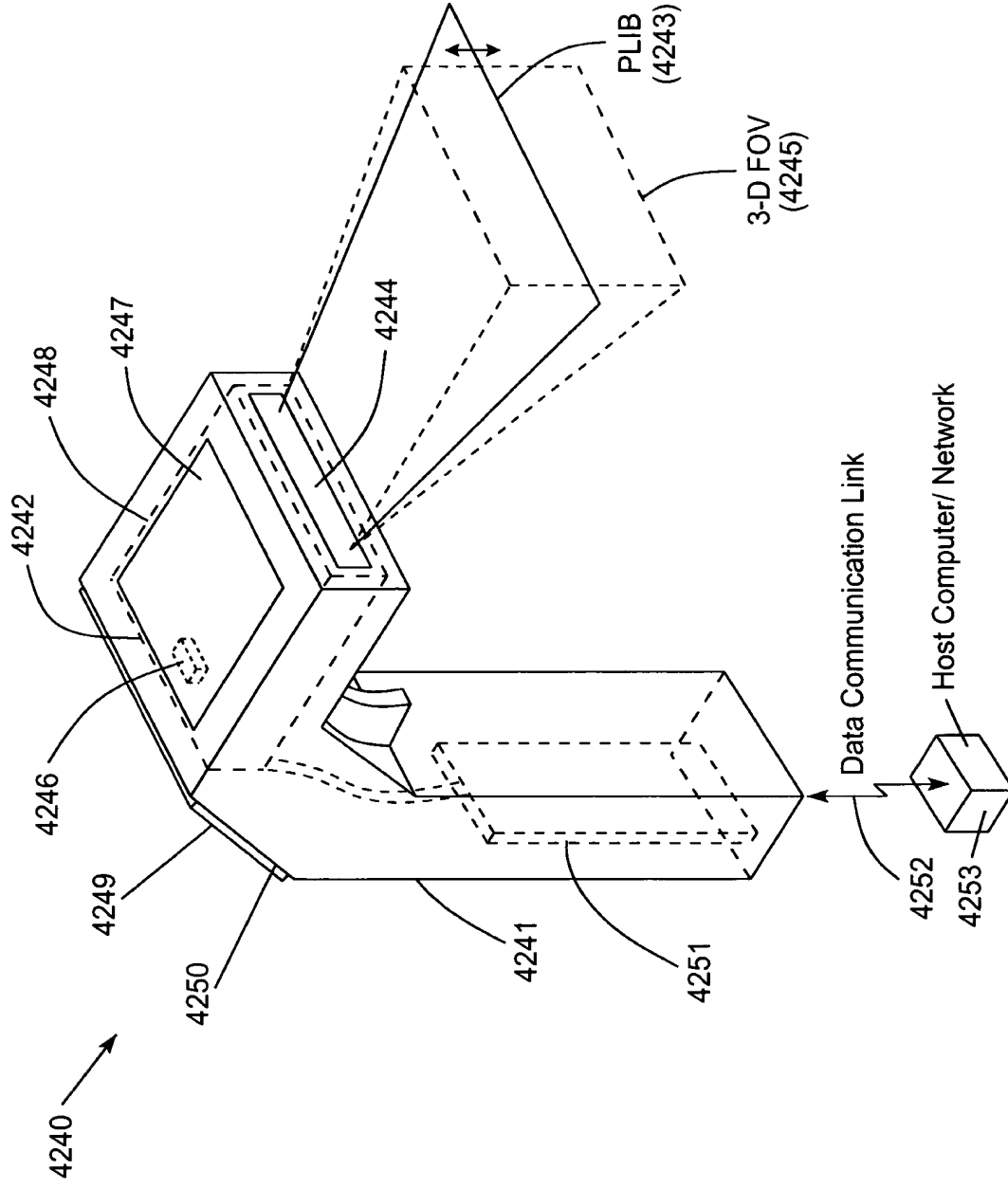
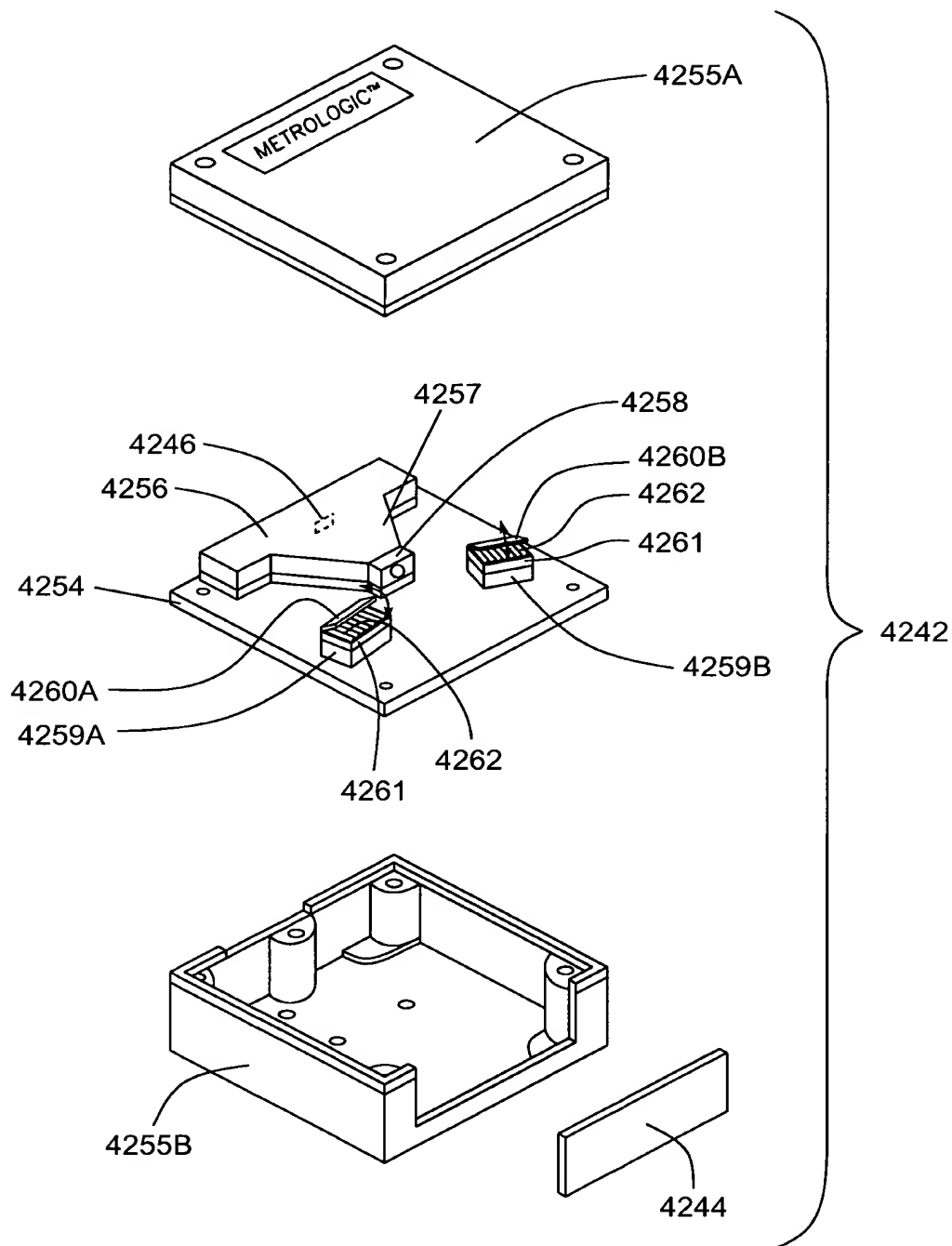


FIG. 60A



Etalon (Temp. Phase Mod.)  
Fig. 1117A-17B

FIG. 60B

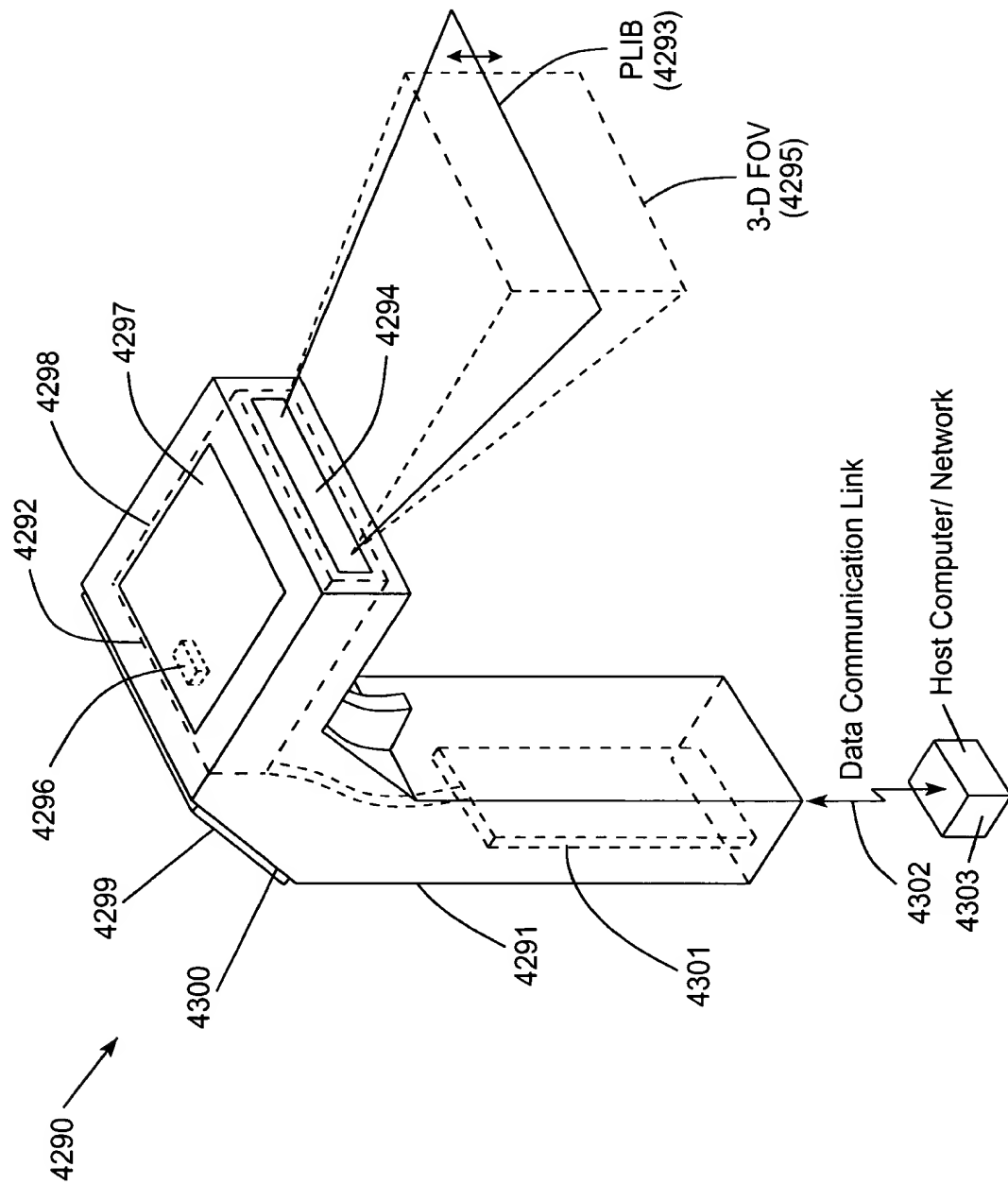
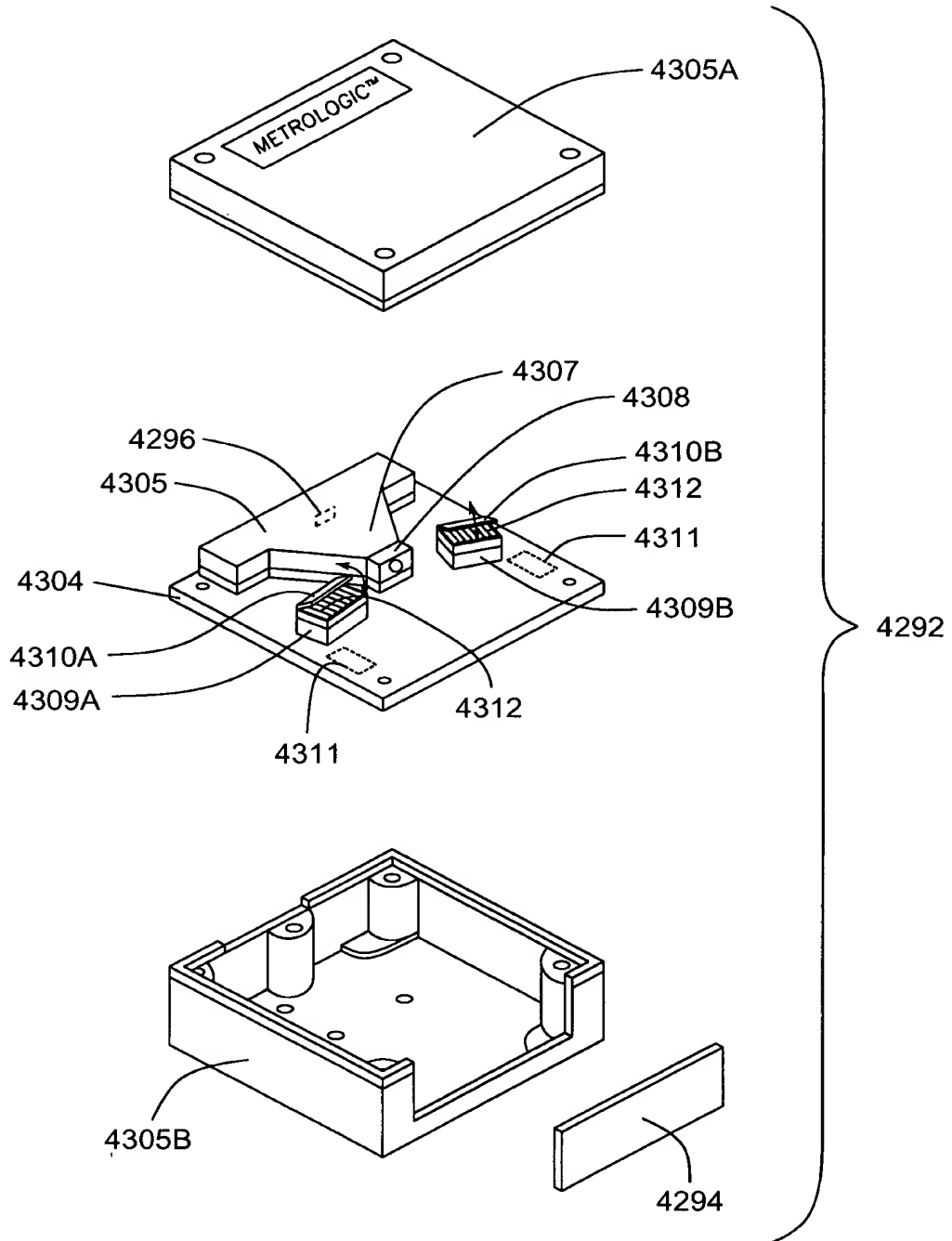


FIG. 61A



Mode Hopping  
Fig. 1119A-19B

FIG. 61B

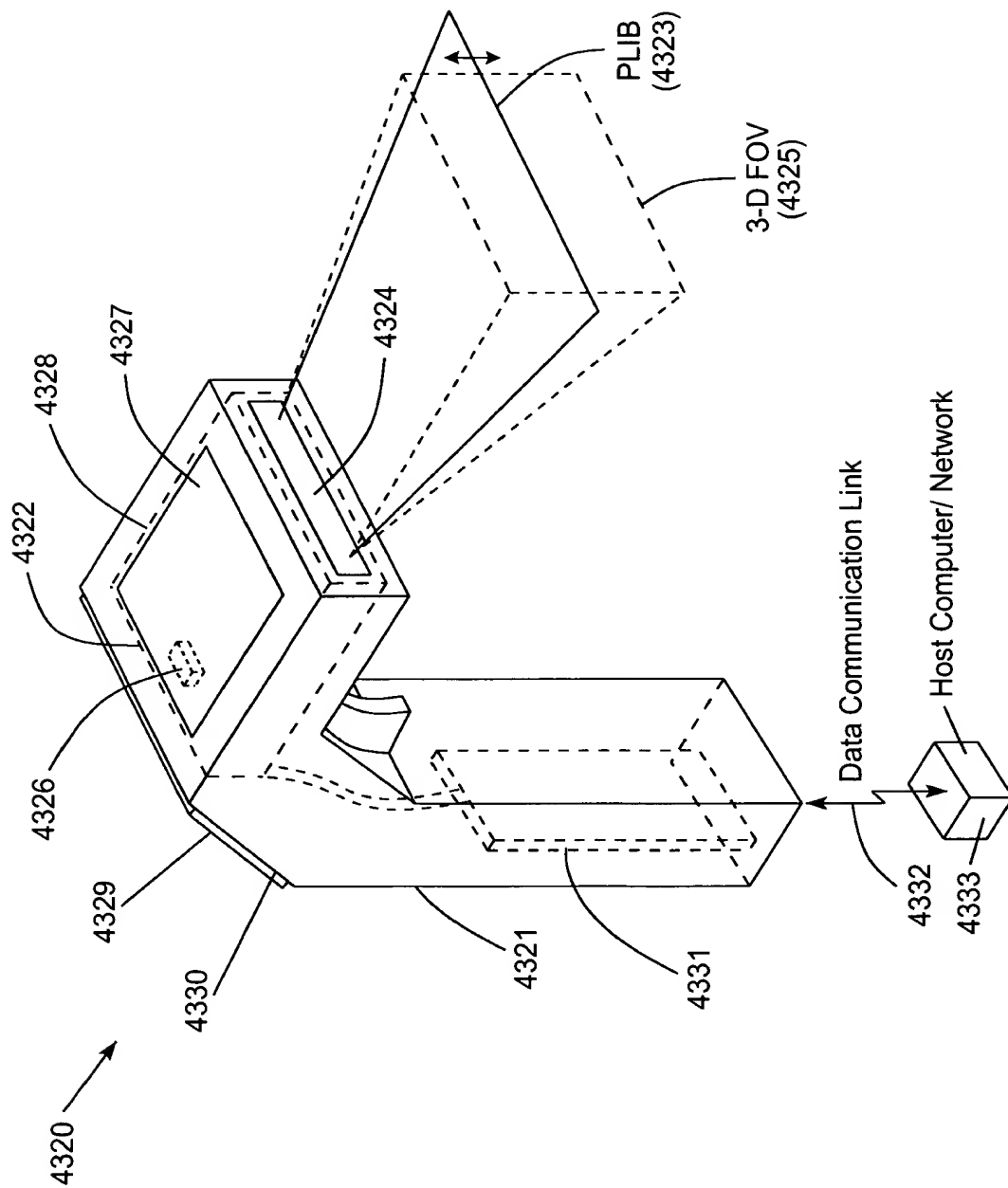
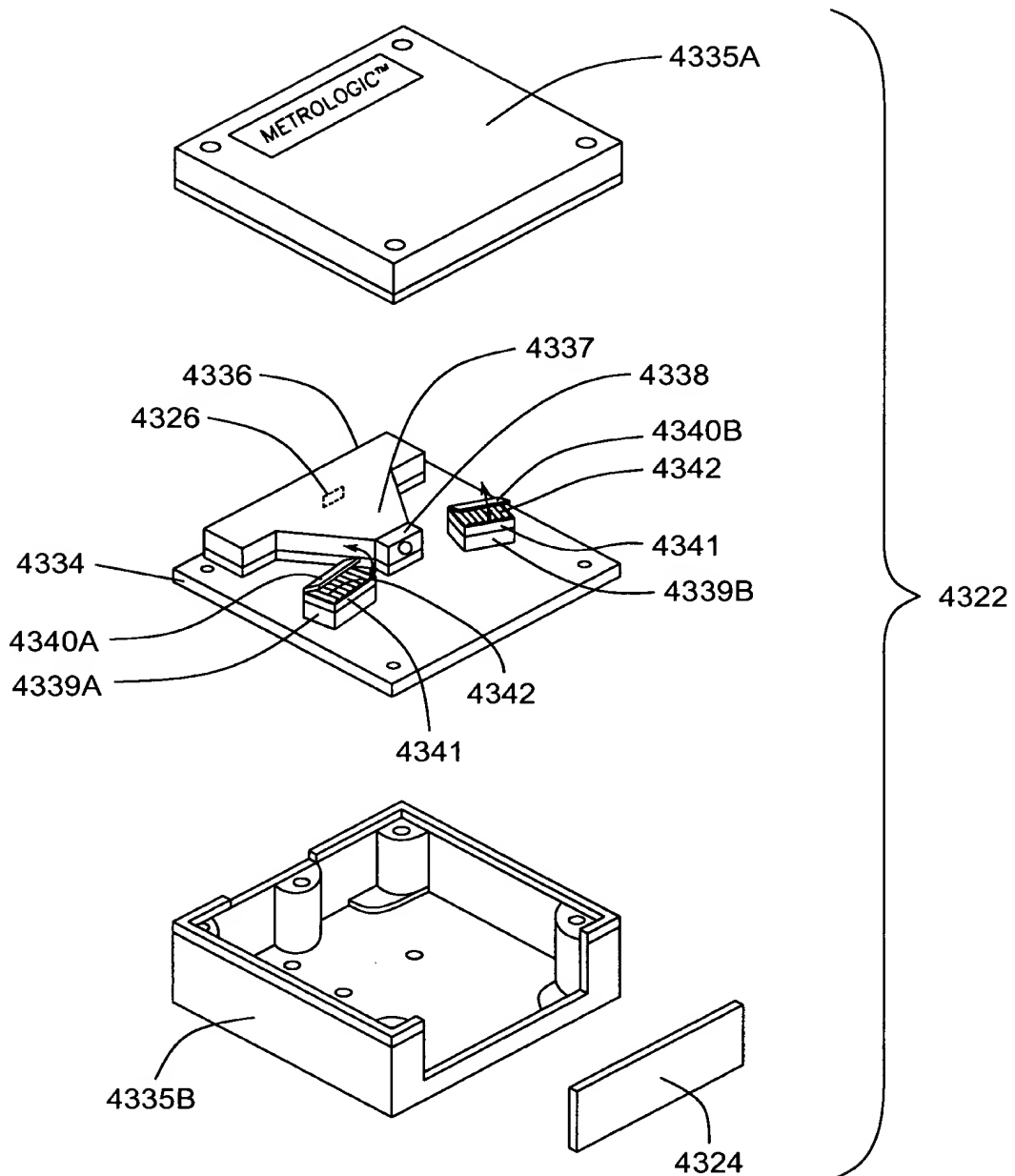


FIG. 62A



Micro-oscillating  
Spatial Intensity  
Modulation Panels  
Fig. 1I21A-21D

FIG. 62B

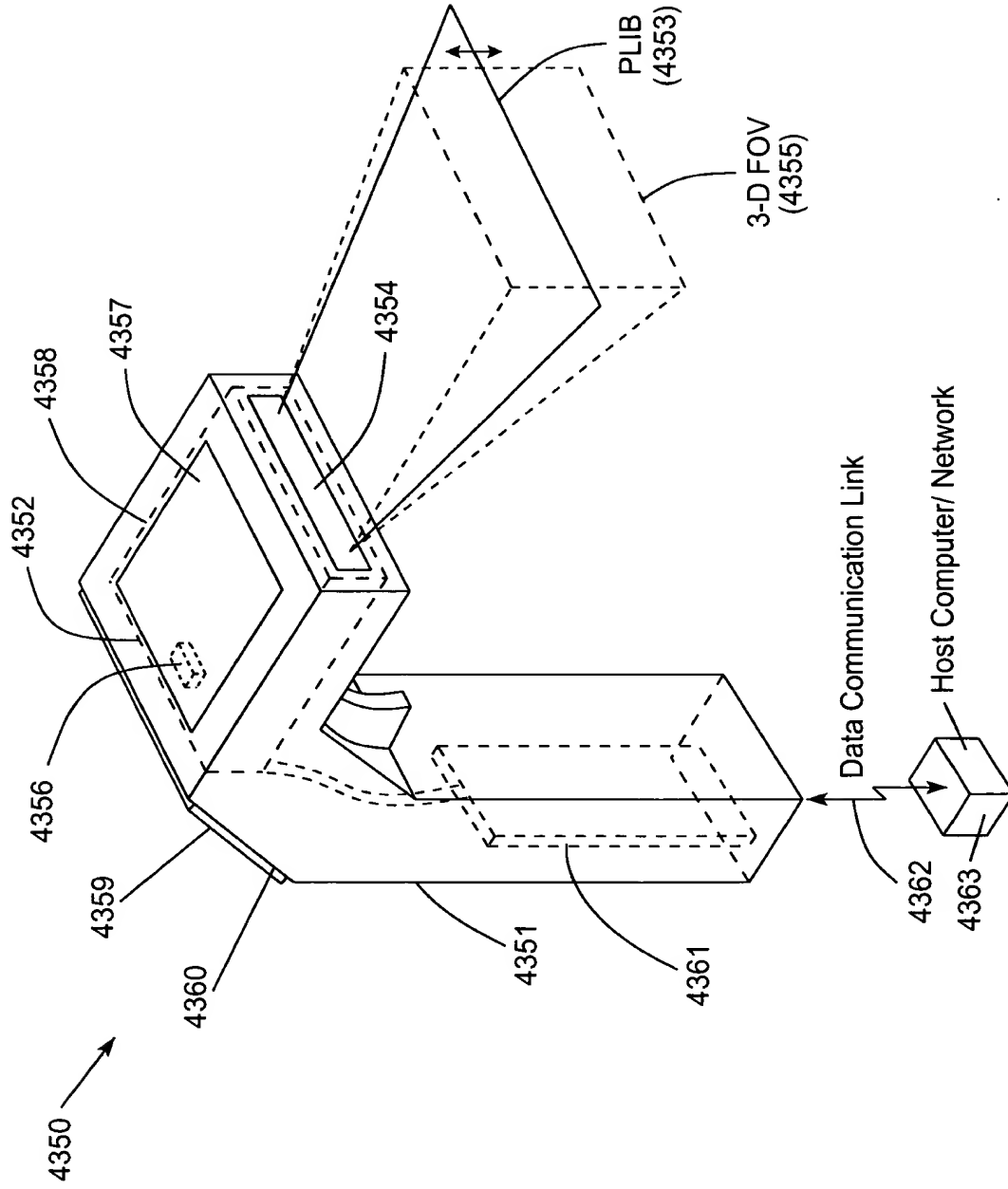
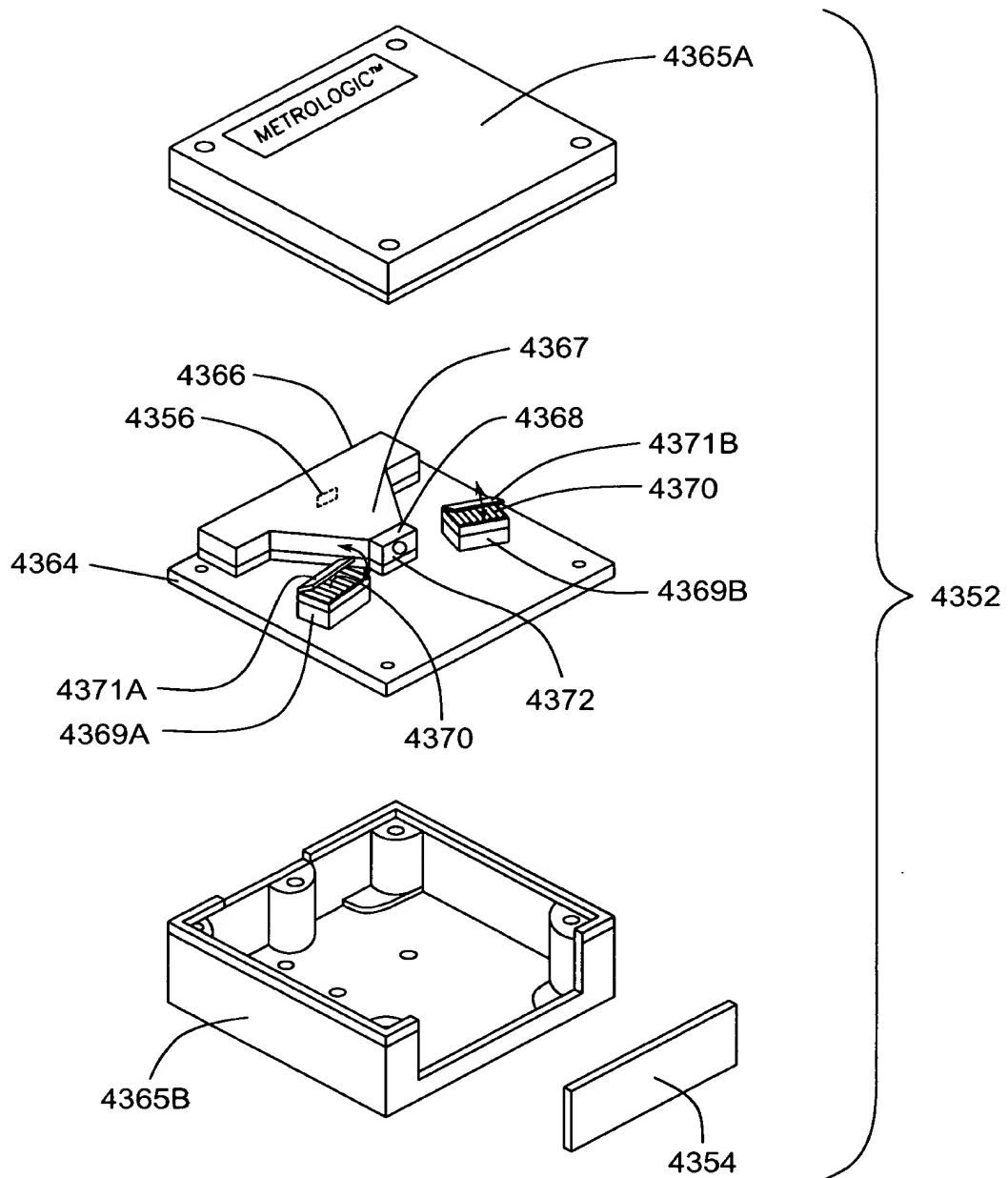


FIG. 63A



EO or Mechanically  
Rotating Iris

Fig. 1123A-23B

FIG. 63B



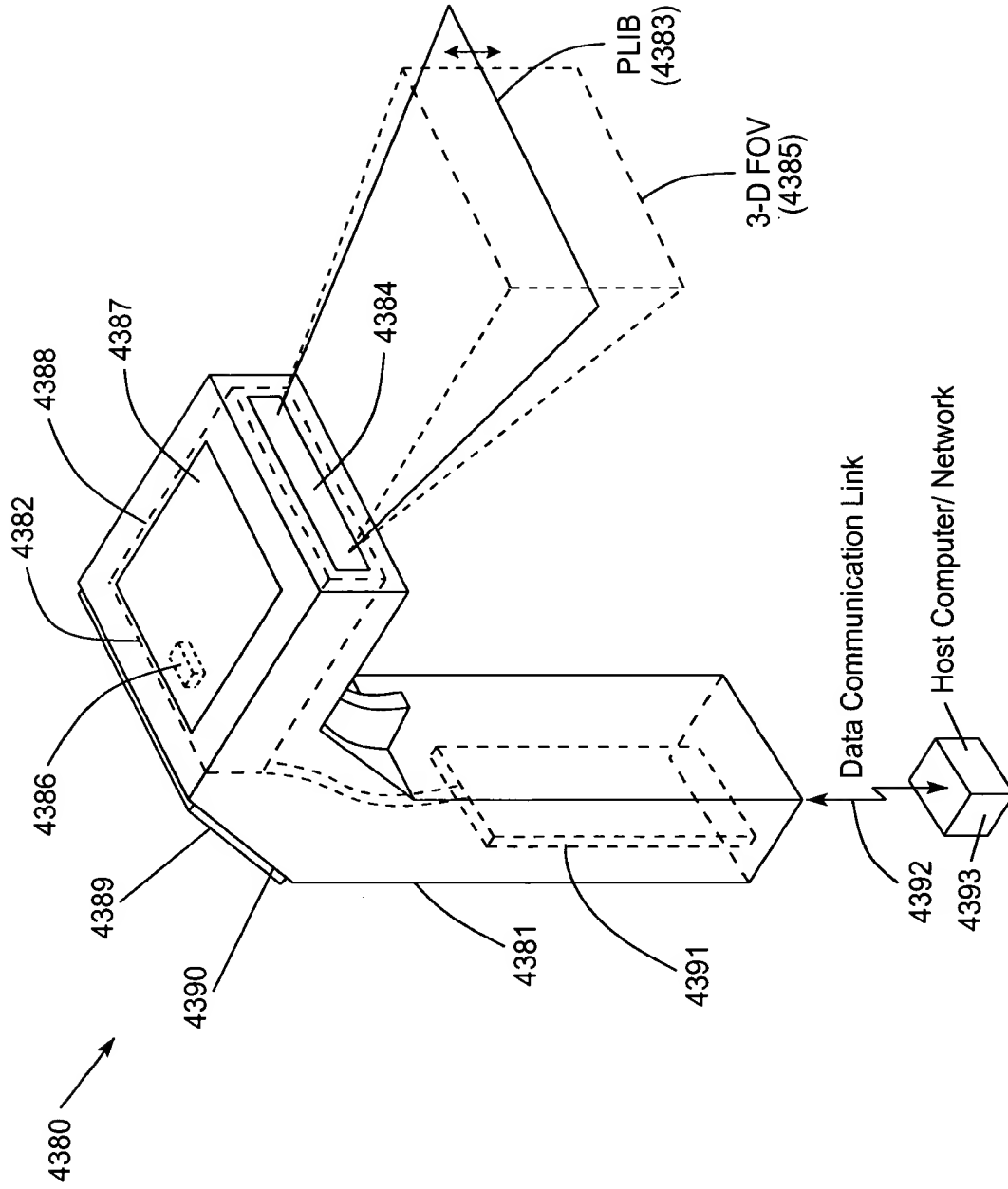
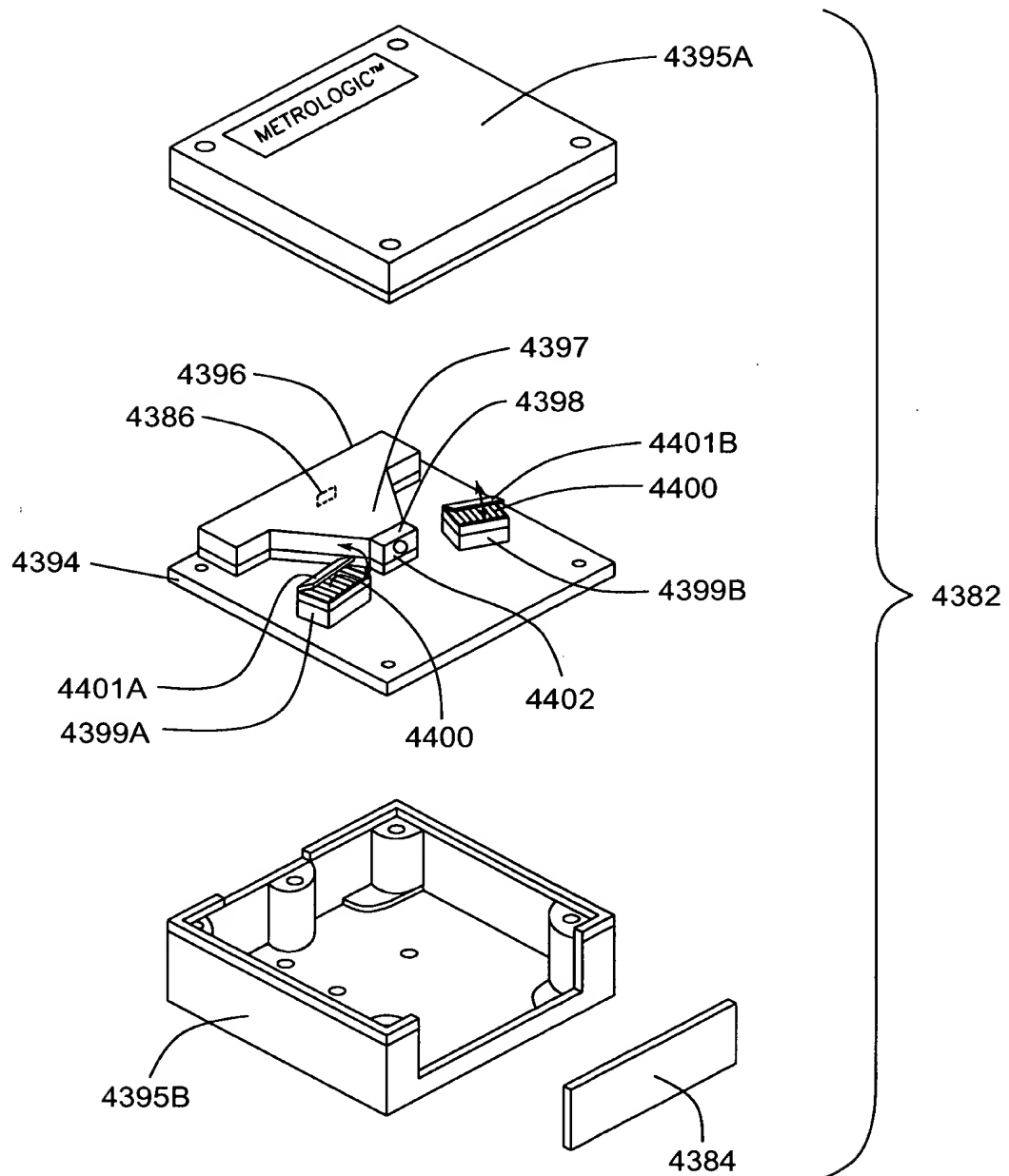


FIG. 64A



E-optical Shutter  
Before IFD Lens

Fig. 1124A

FIG. 64B

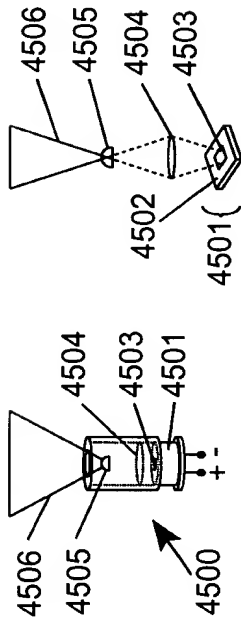


FIG. 65A

FIG. 65B

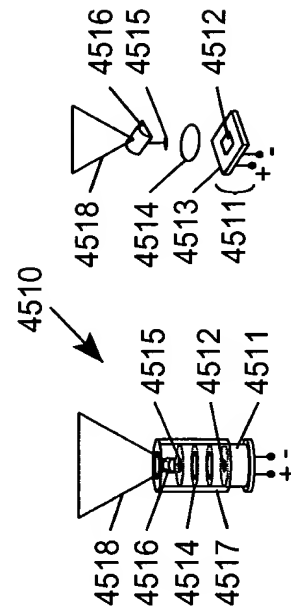


FIG. 66A

FIG. 66B

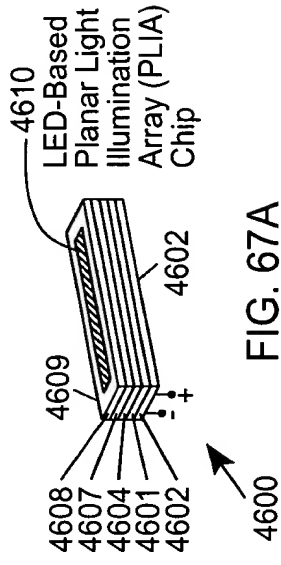


FIG. 67A

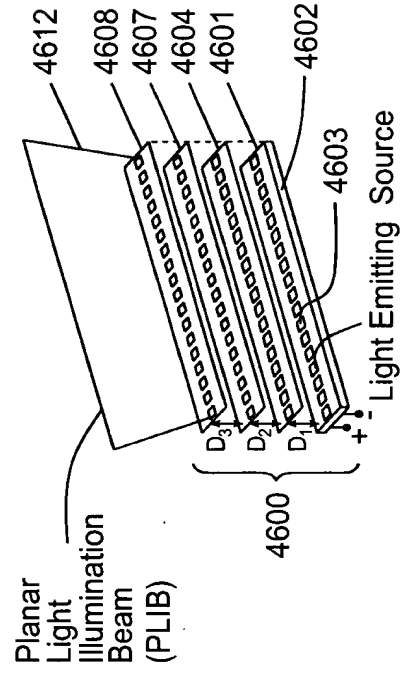


FIG. 67B

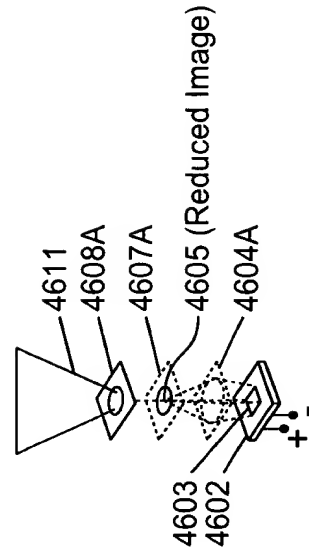


FIG. 67C

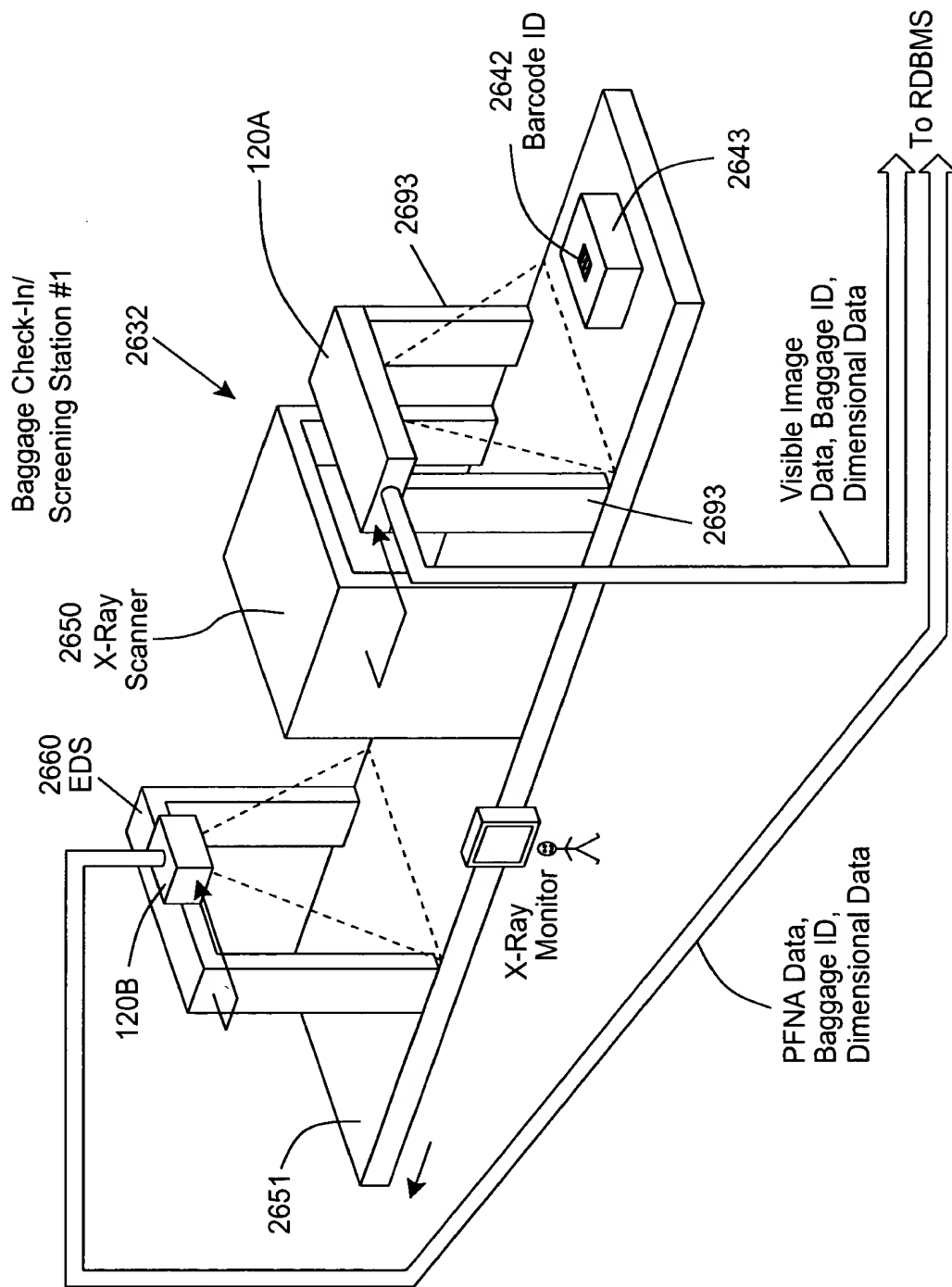
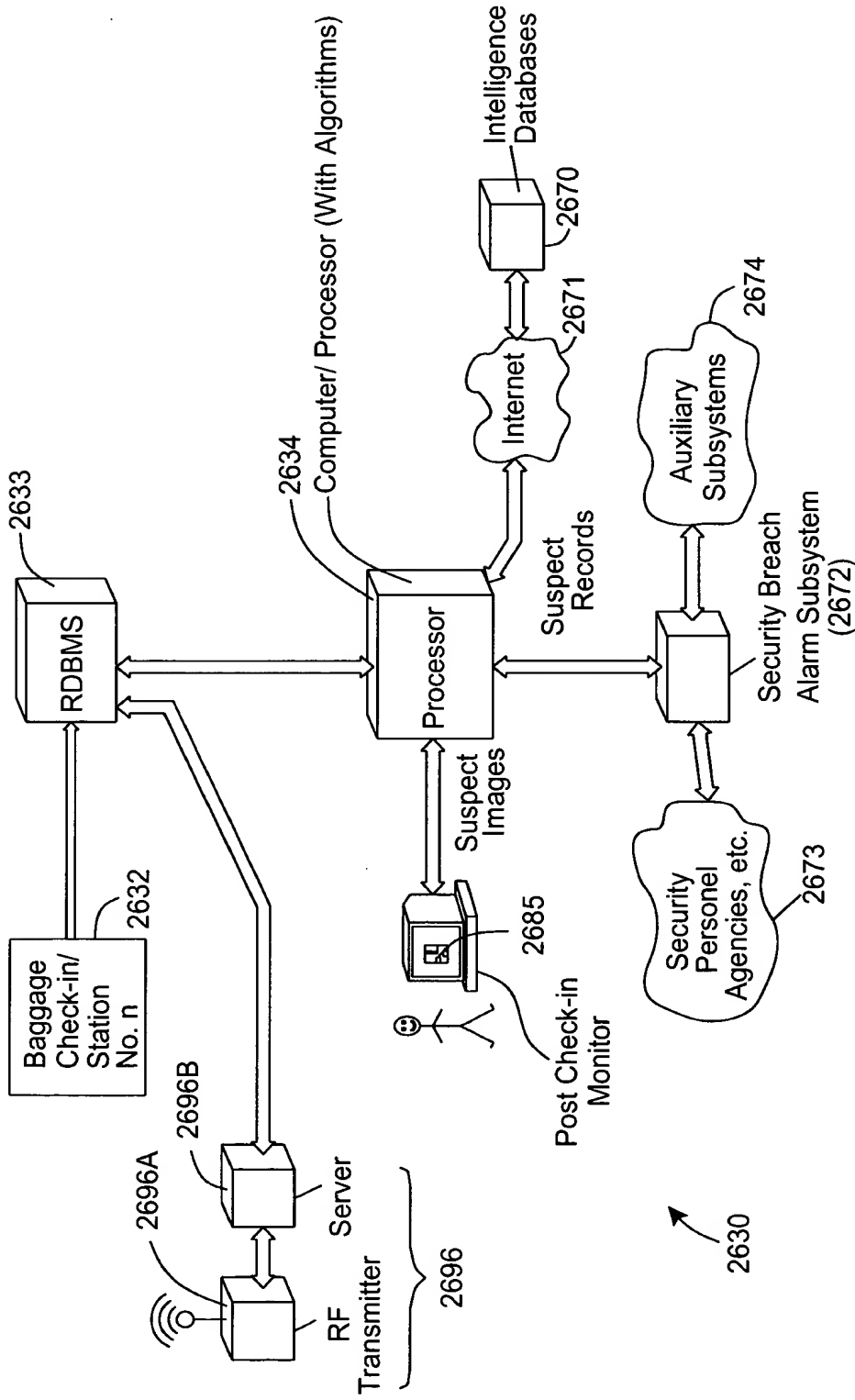


FIG. 68-1



"Airport Security System"

FIG. 68-2

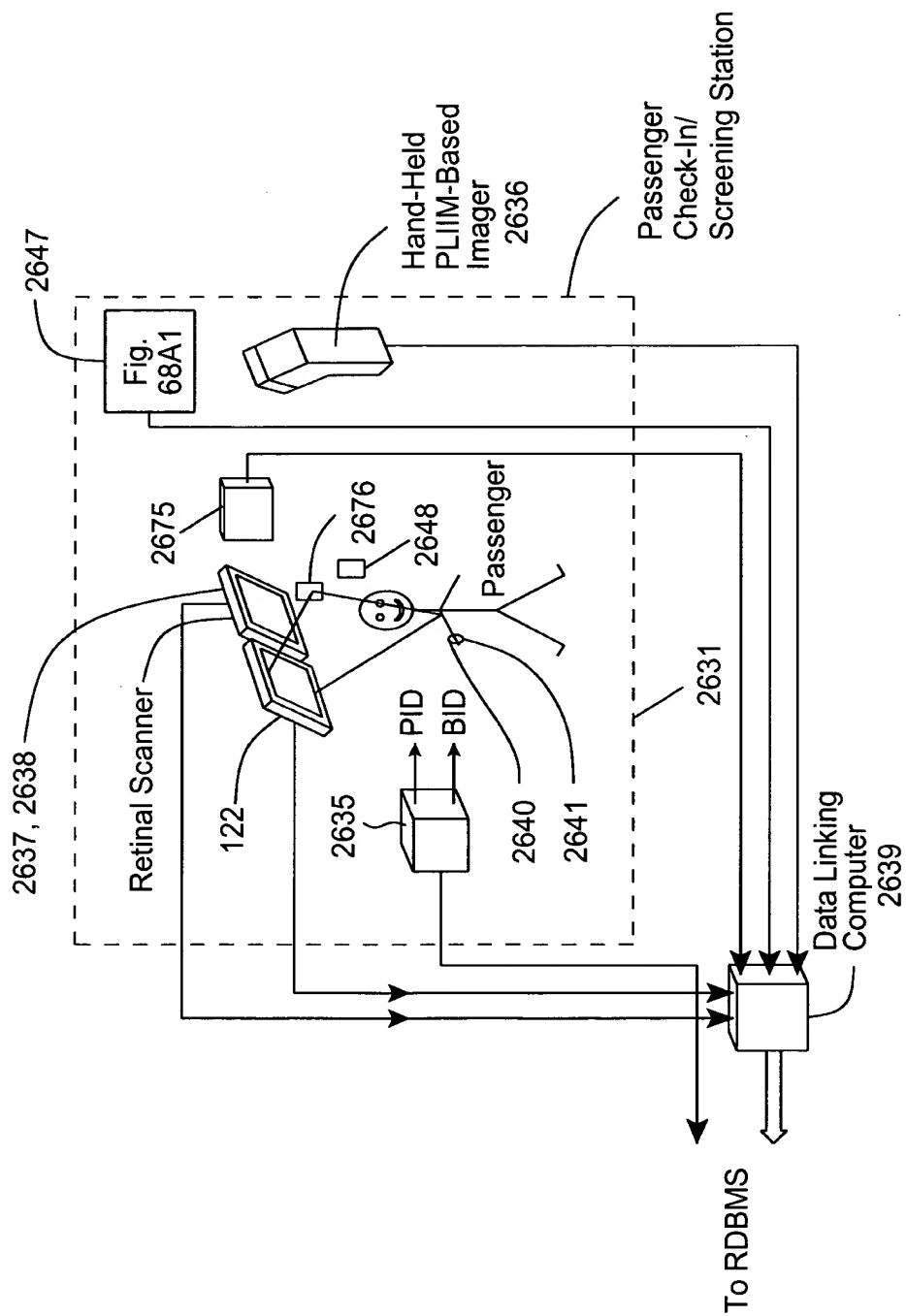


FIG. 68-3

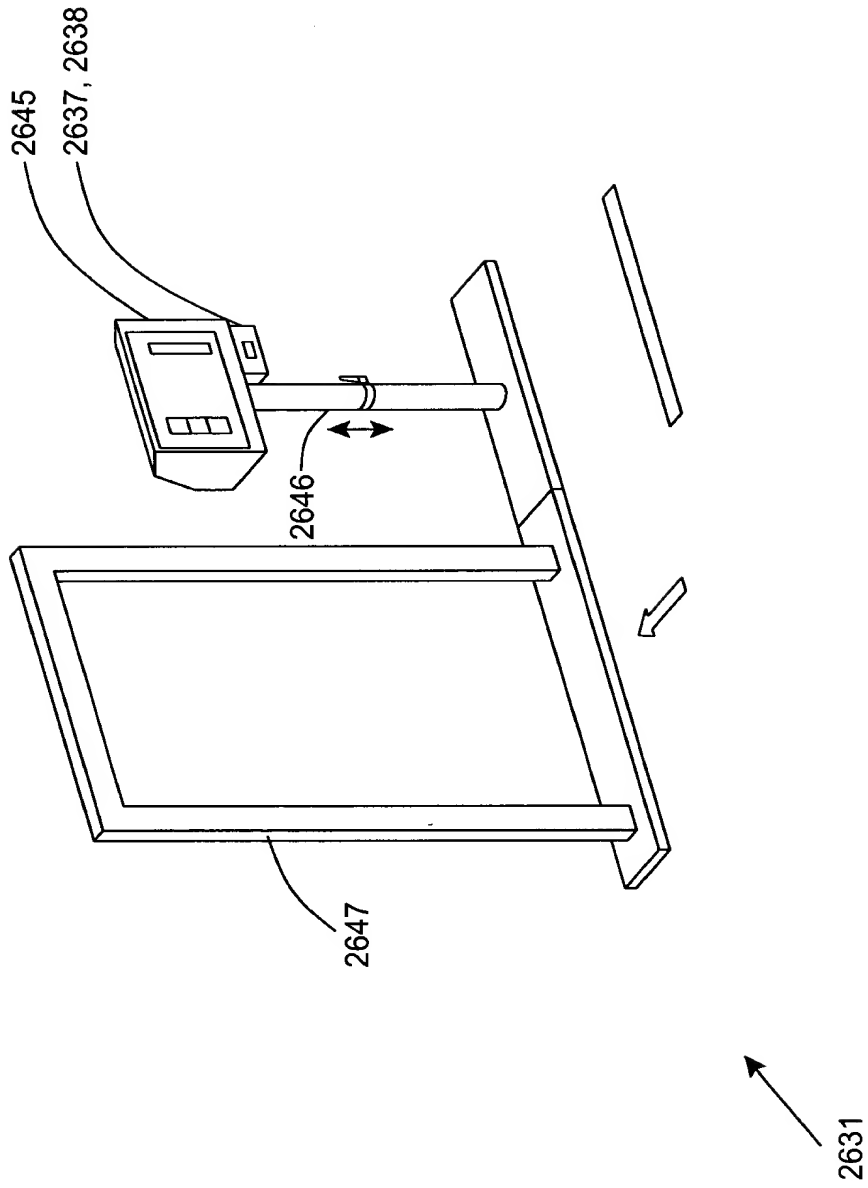
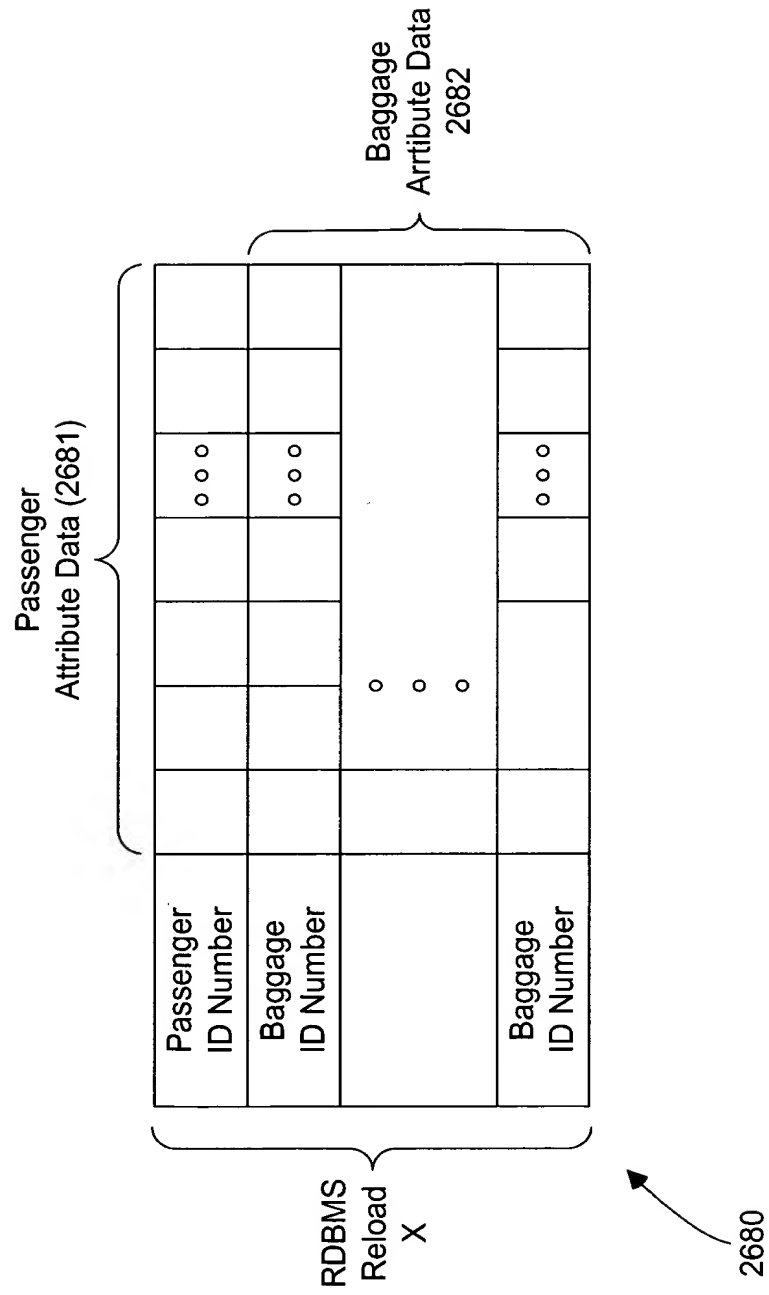


FIG. 68A





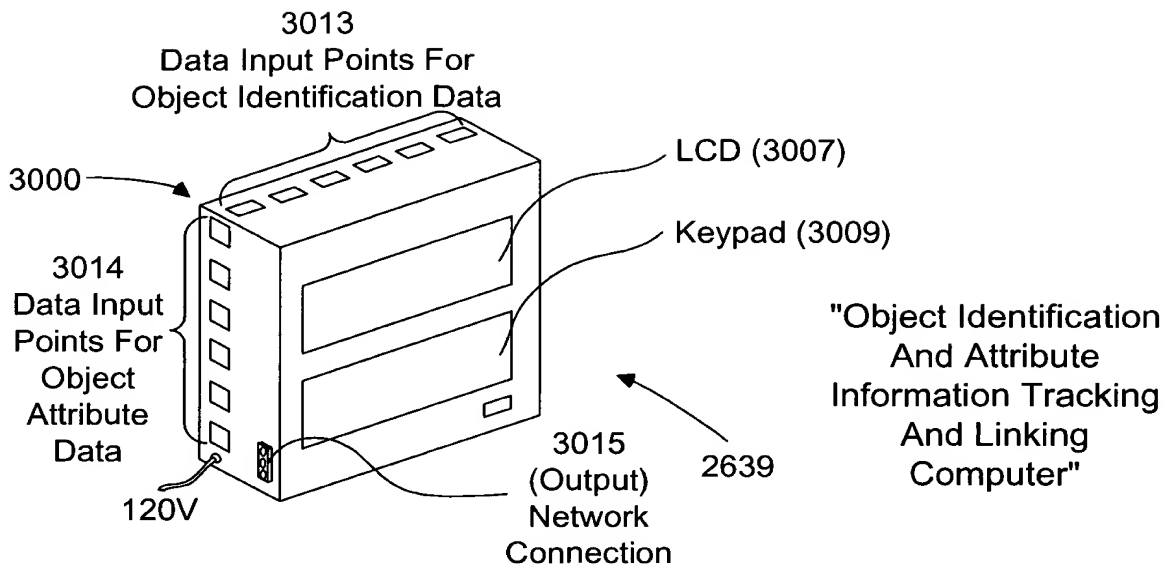


FIG. 68C1

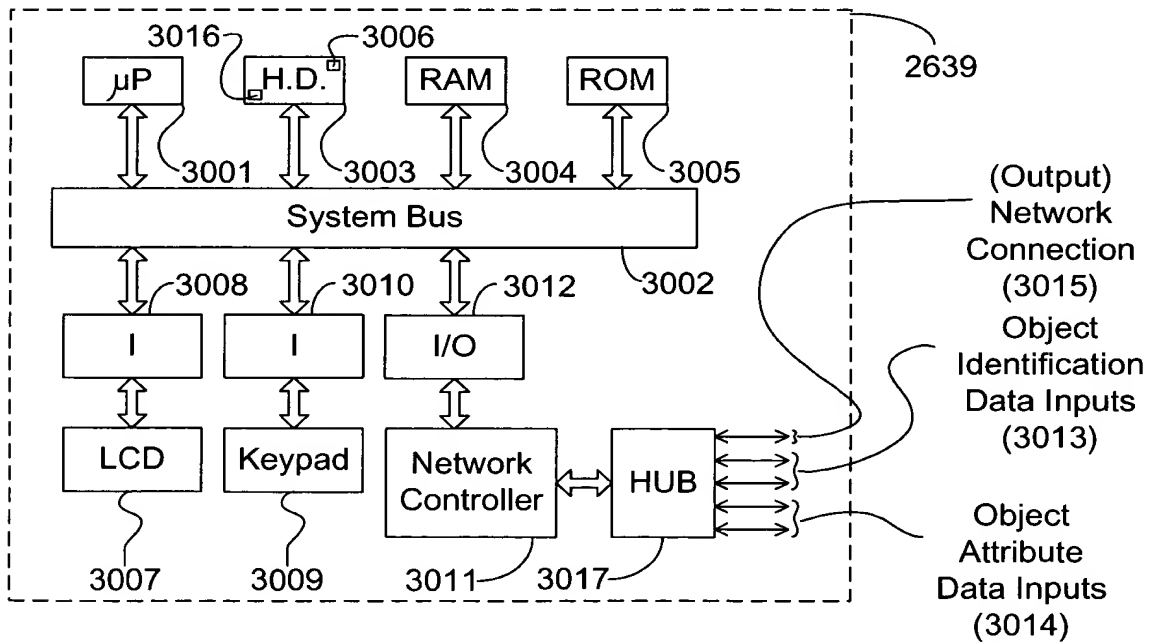


FIG. 68C2



Object Identification And Attribute Information Tracking And Linking Computer System

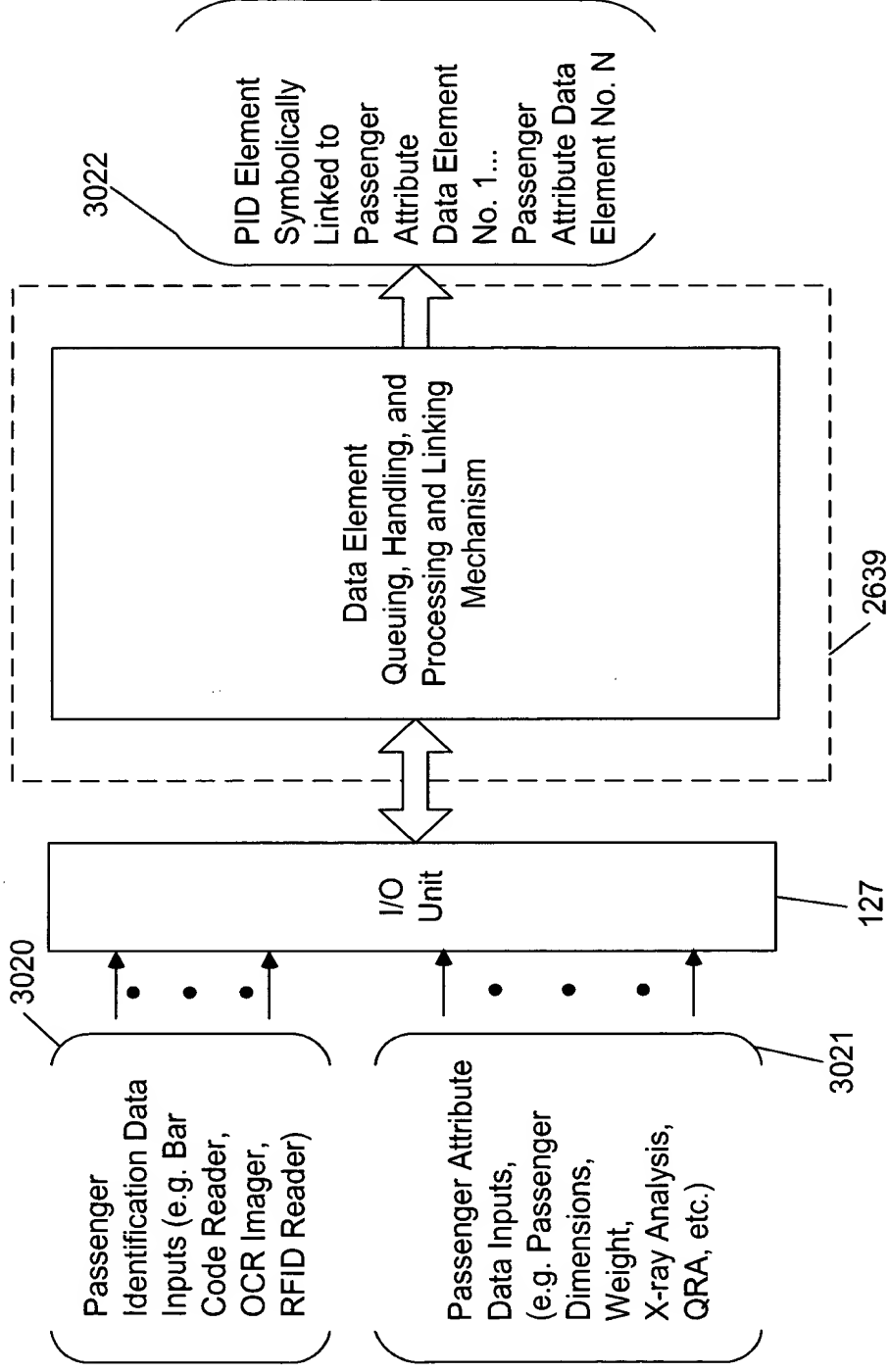


FIG. 68C3



Data Element Queuing, Handling, And Processing Subsystem Employed In The Object Identification And Attribute Acquisition System Of The Present Invention. (131)

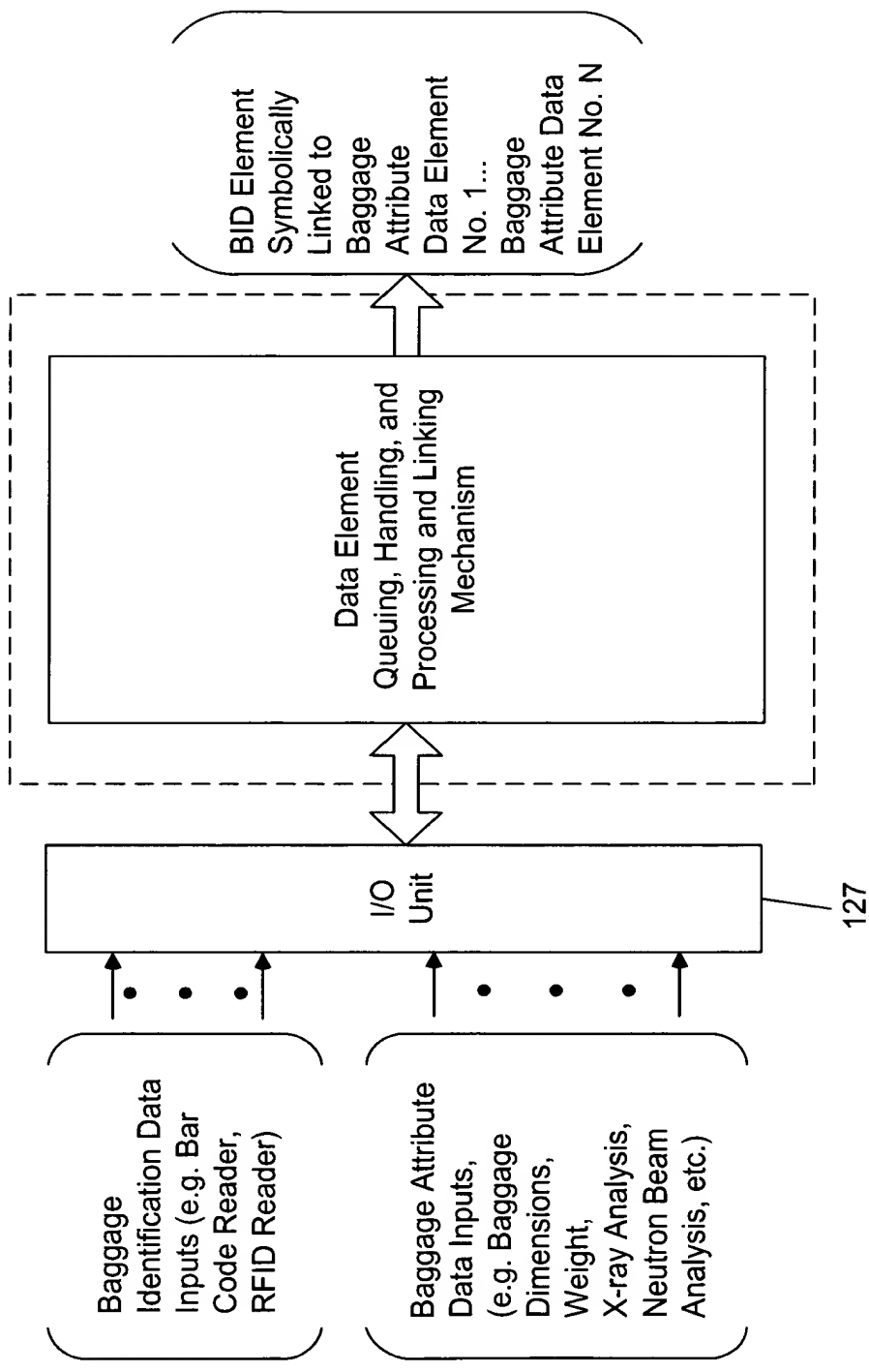


FIG. 68C4

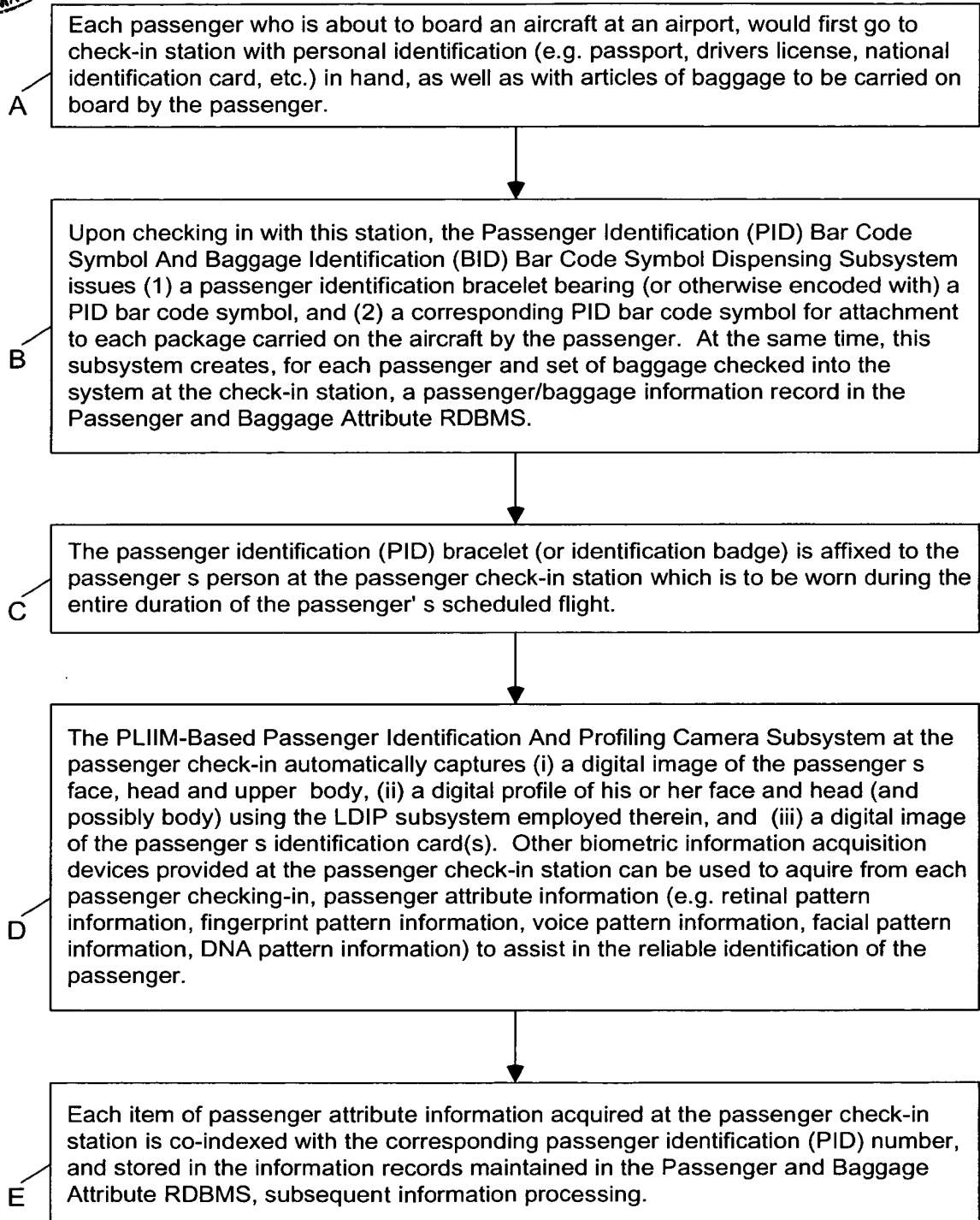


FIG. 68D1

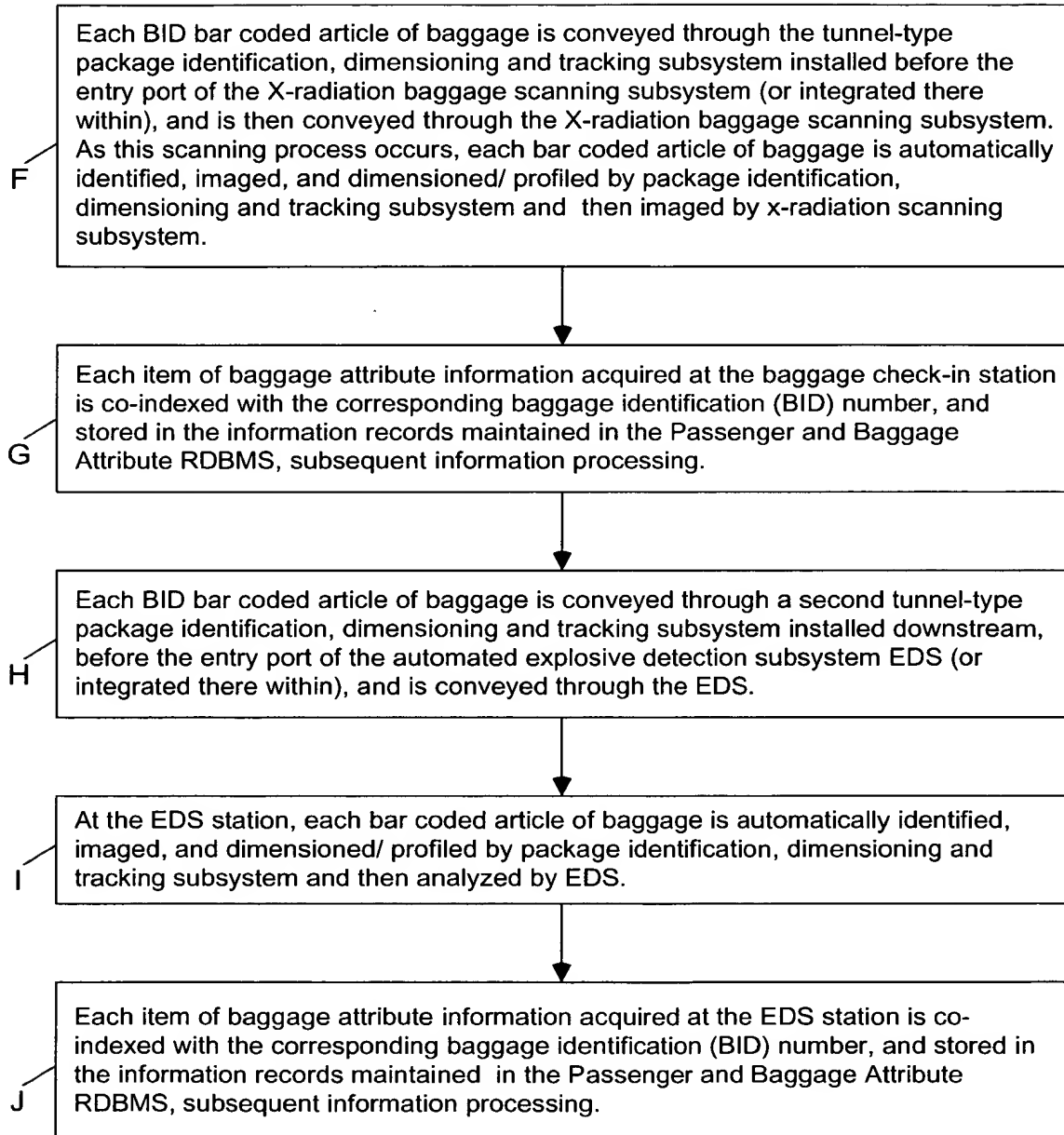


FIG. 68D2

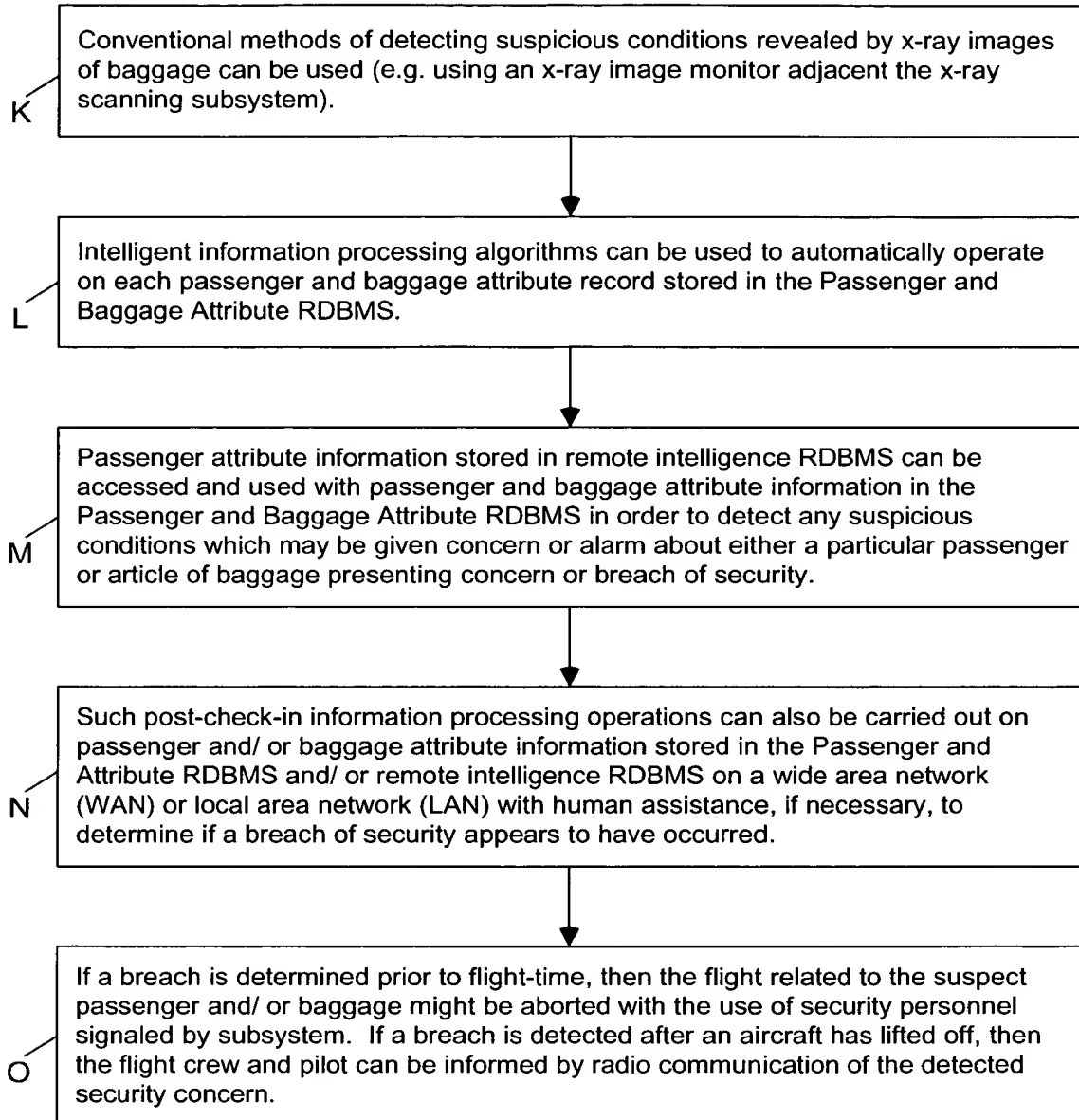
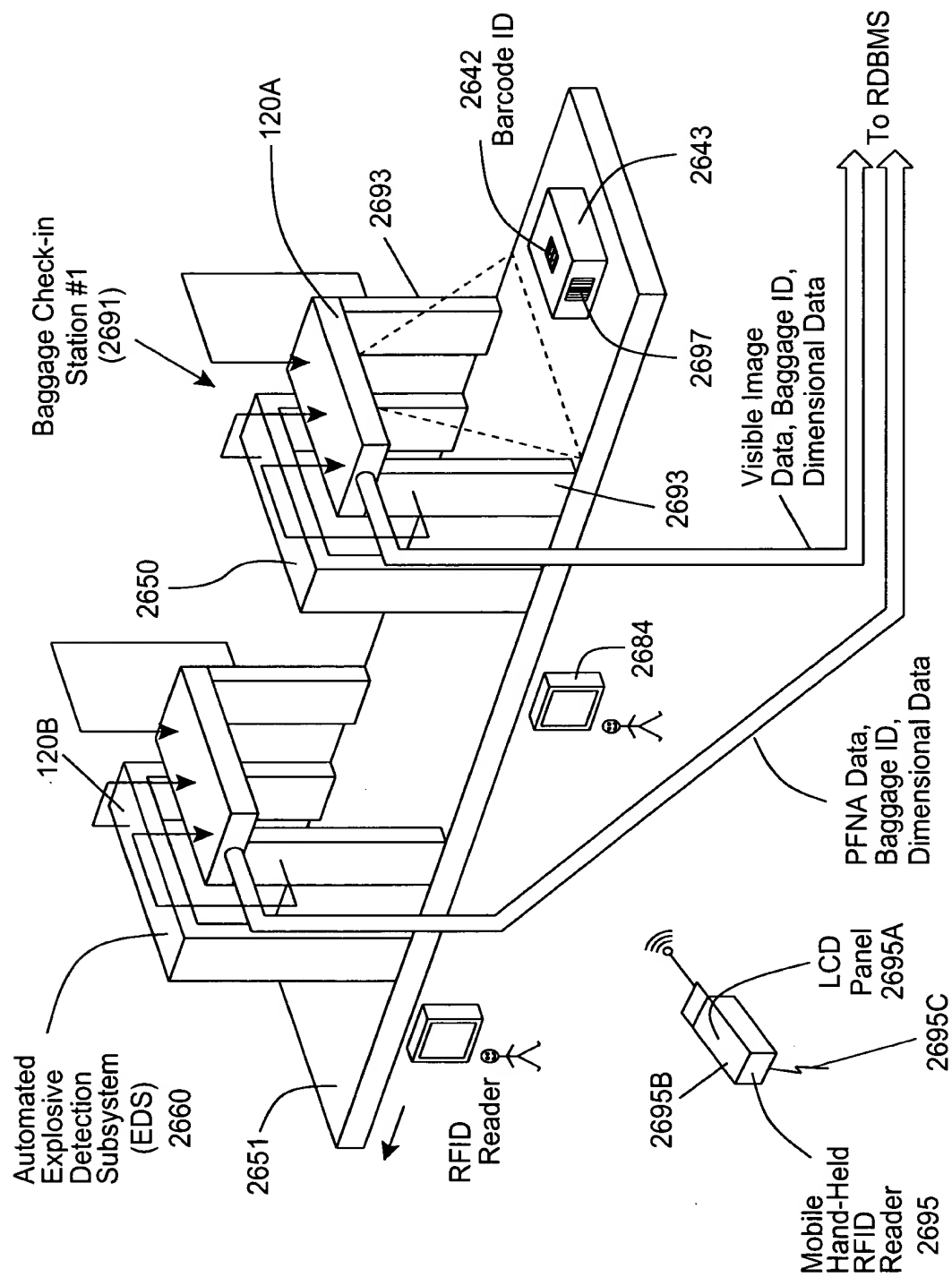


FIG. 68D3



**FIG. 69-1**

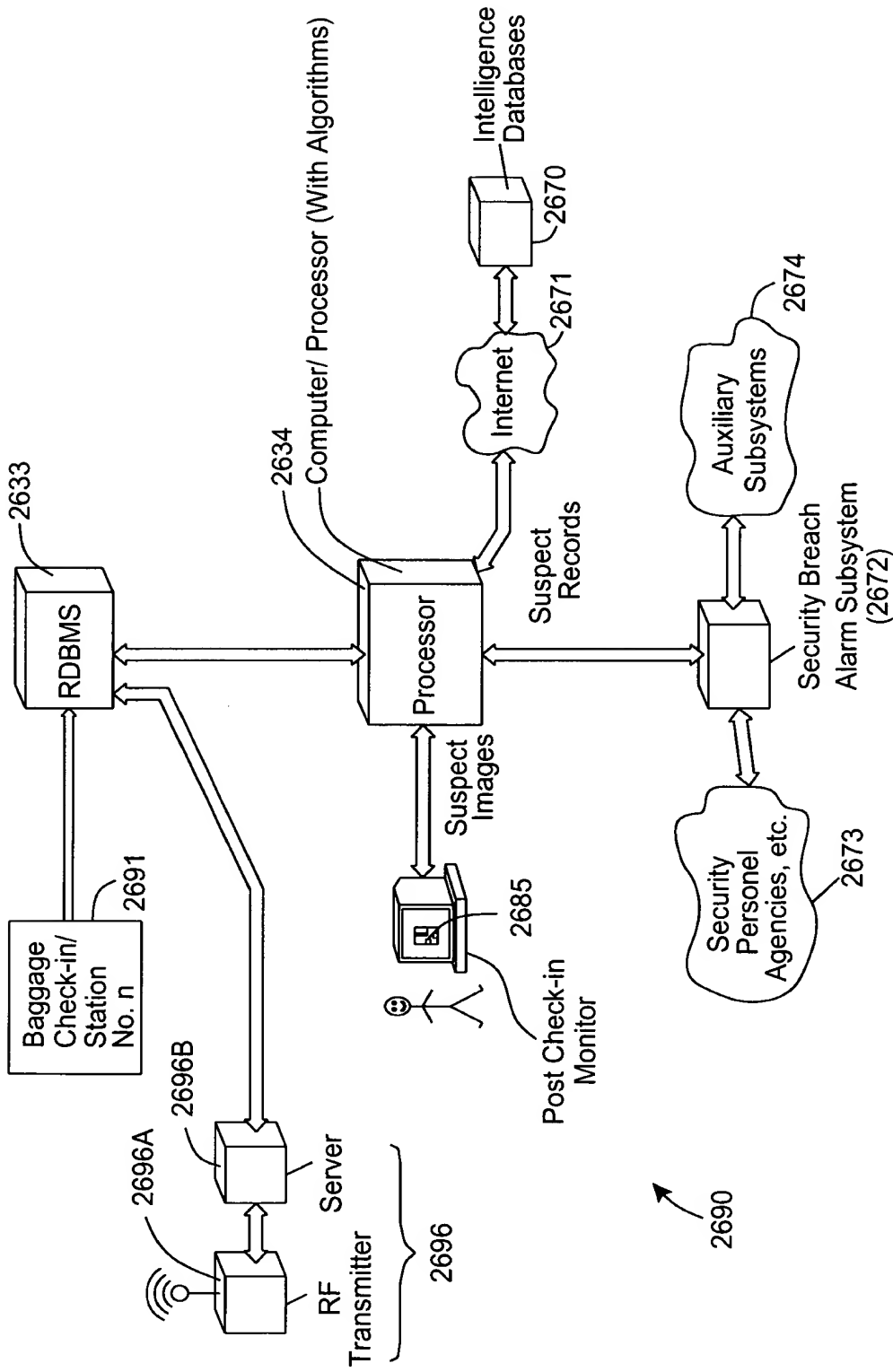


FIG. 69-2



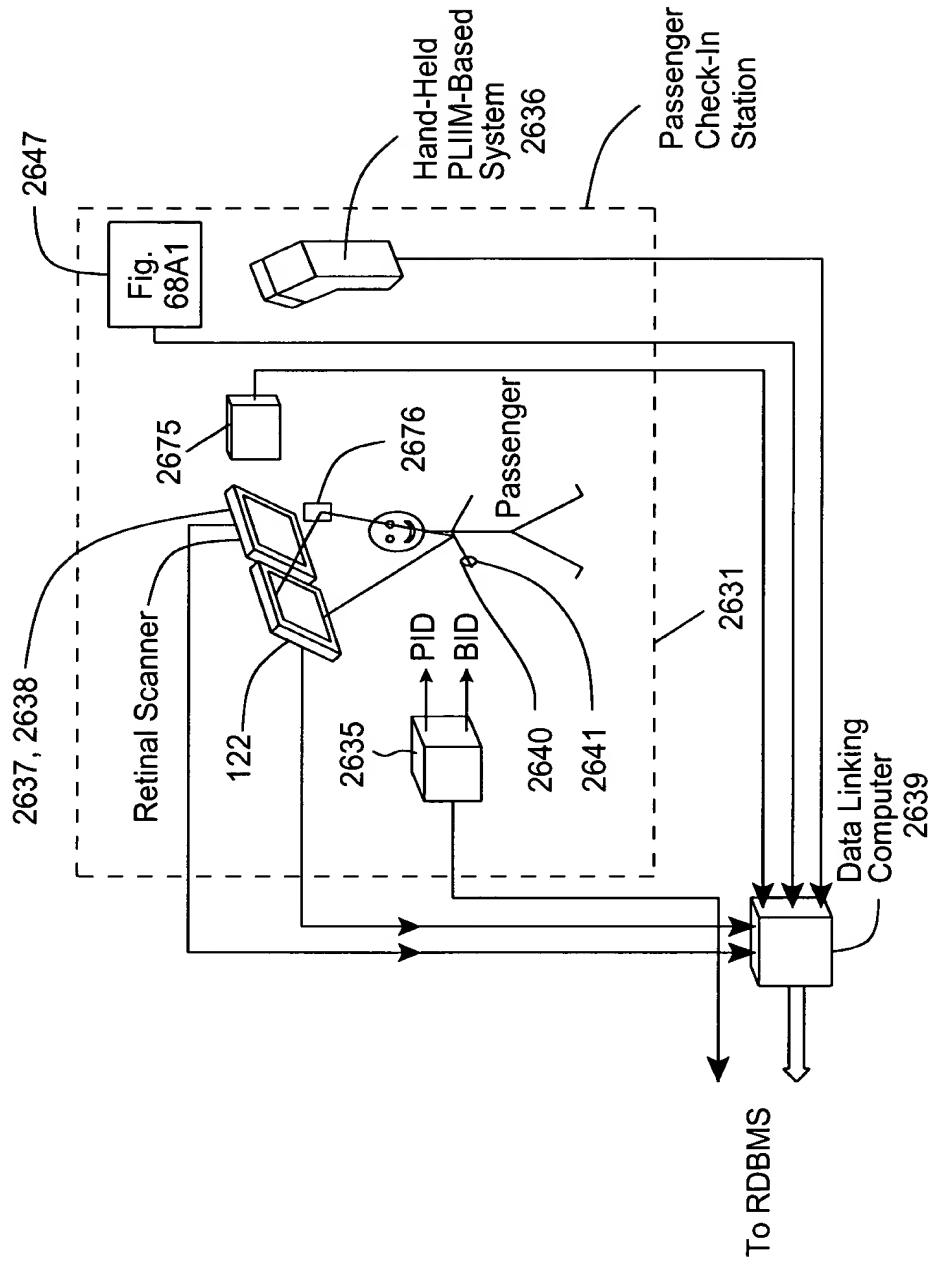


FIG. 69-3

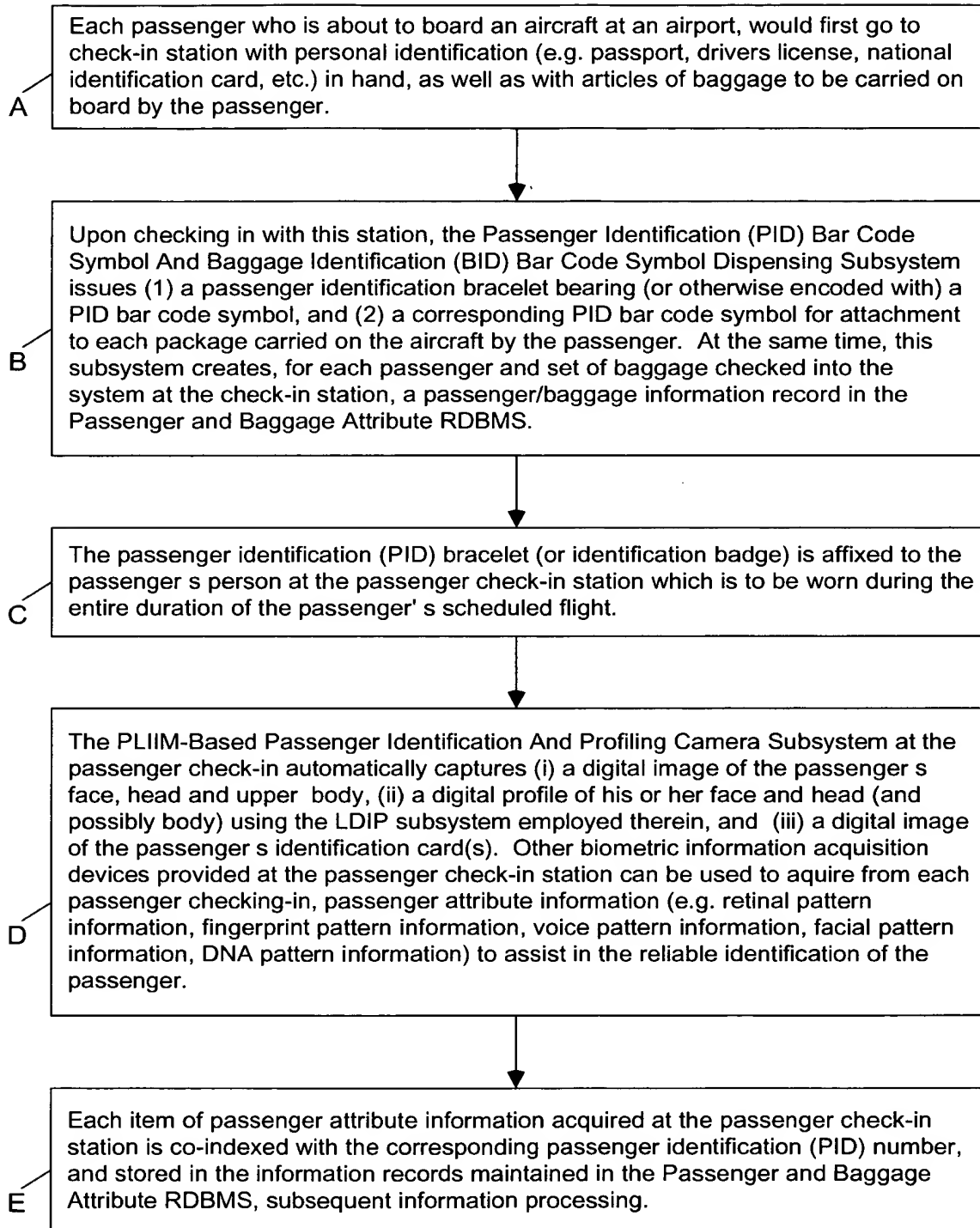


FIG. 69B1

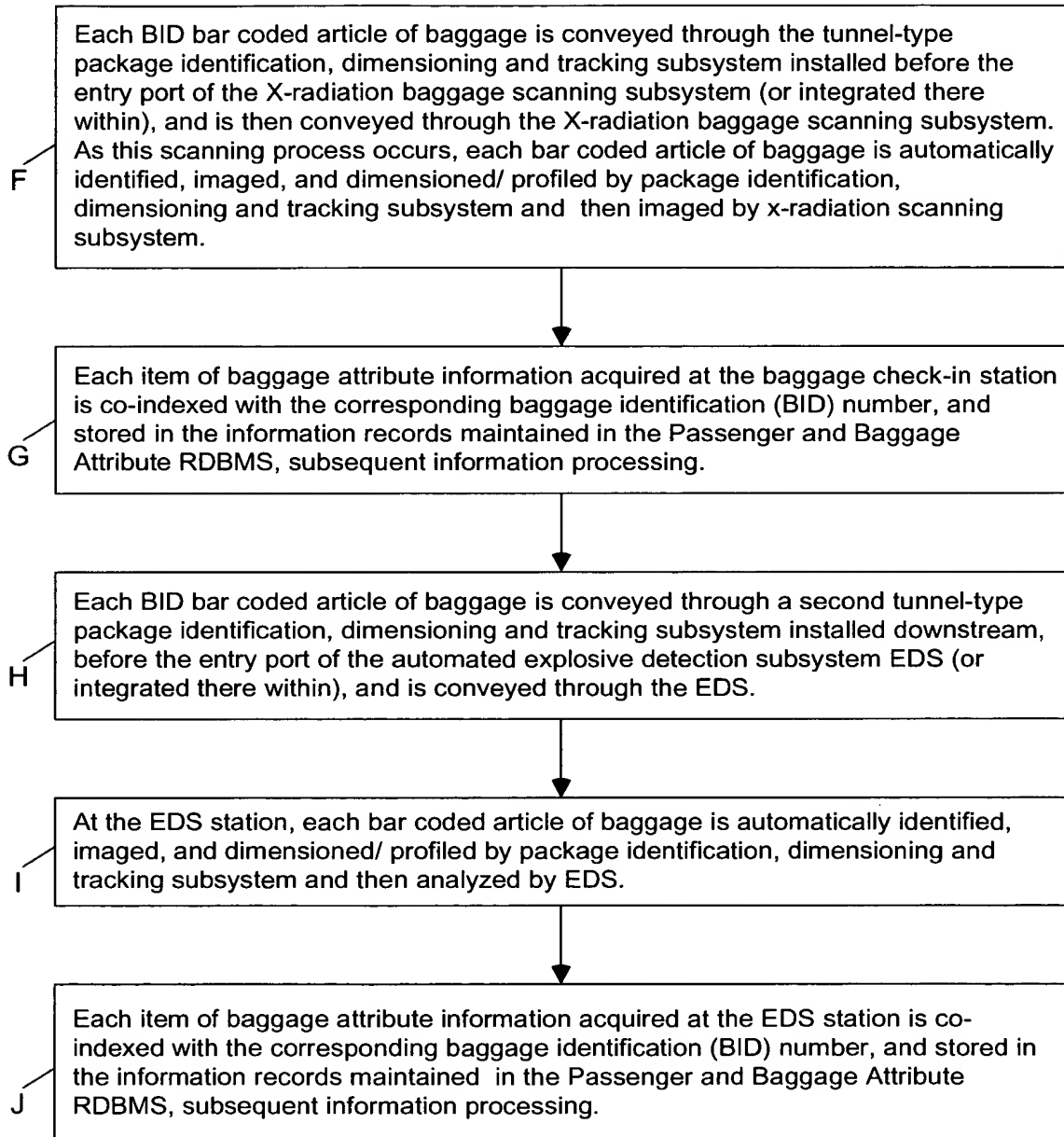


FIG. 69B2

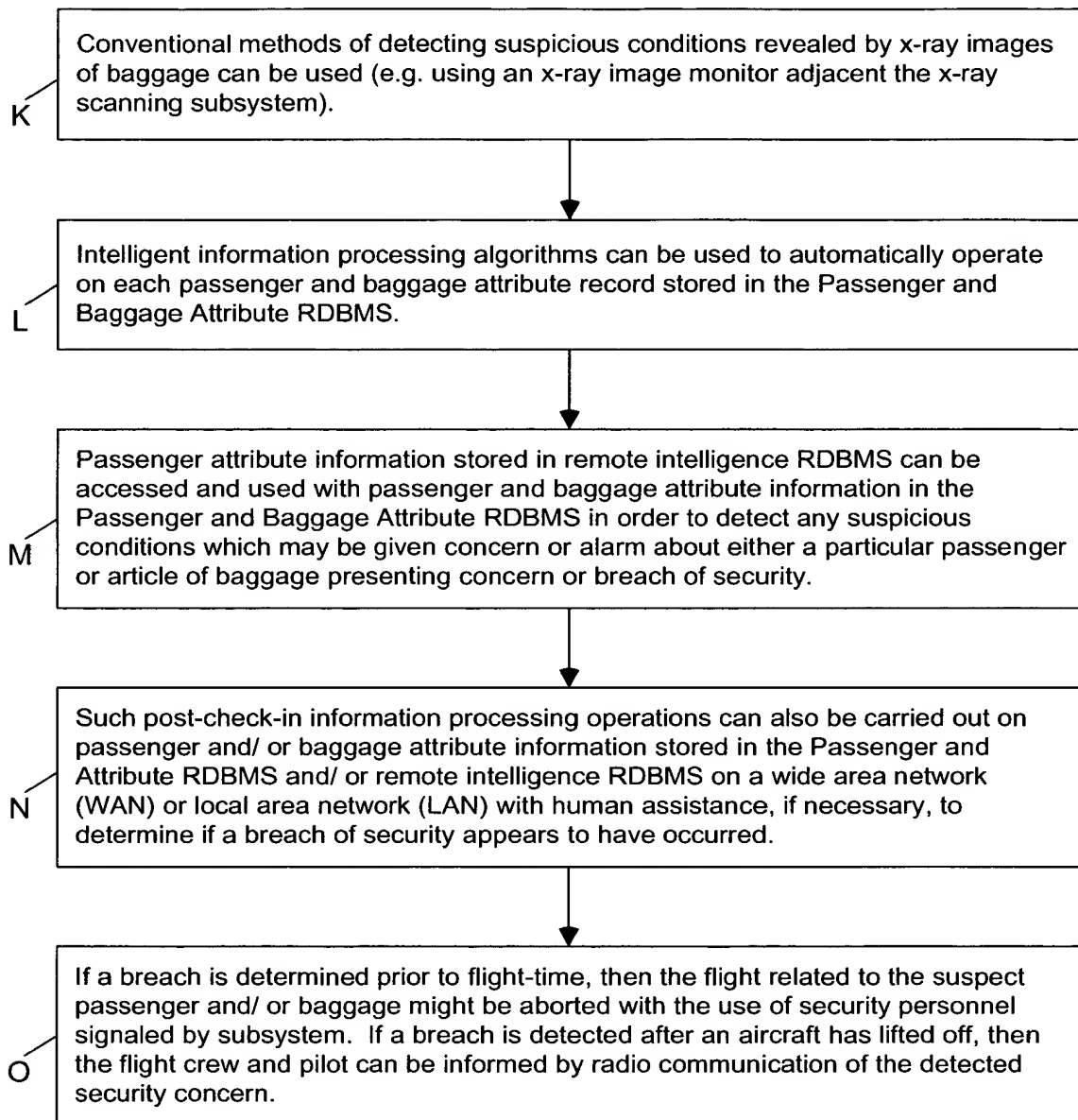


FIG. 69B3

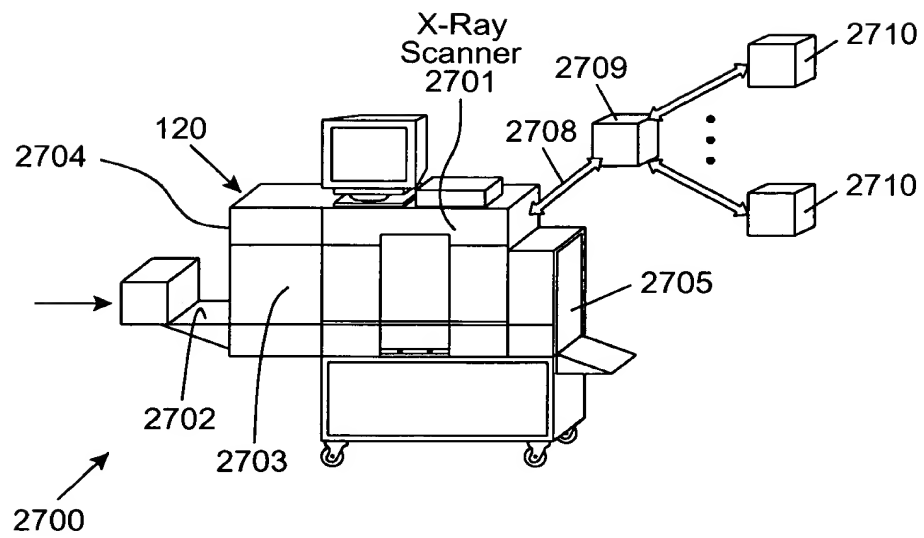


FIG. 70A

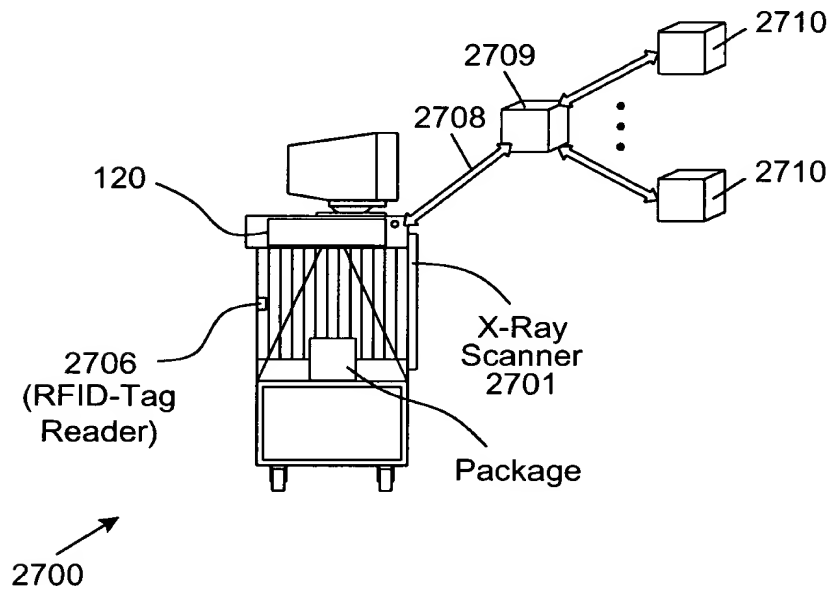


FIG. 70B

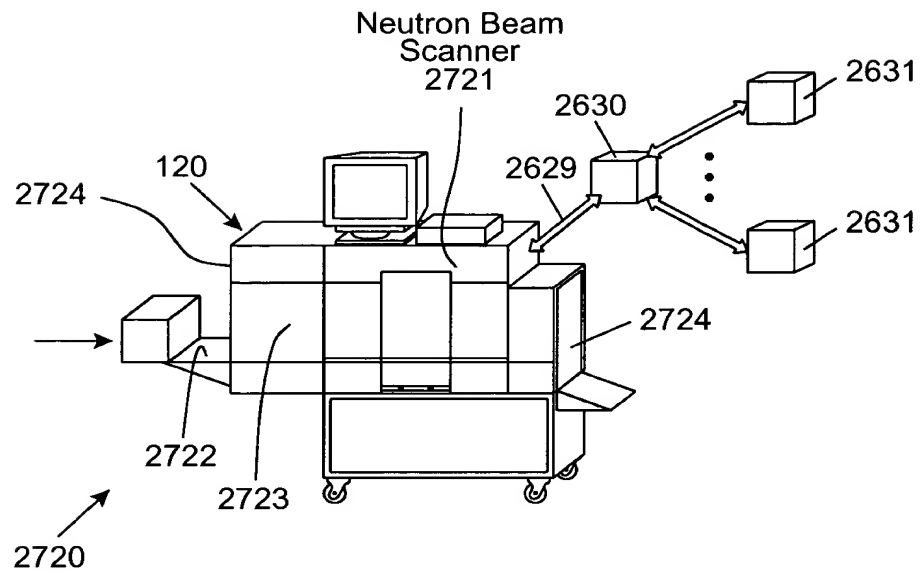


FIG. 71A

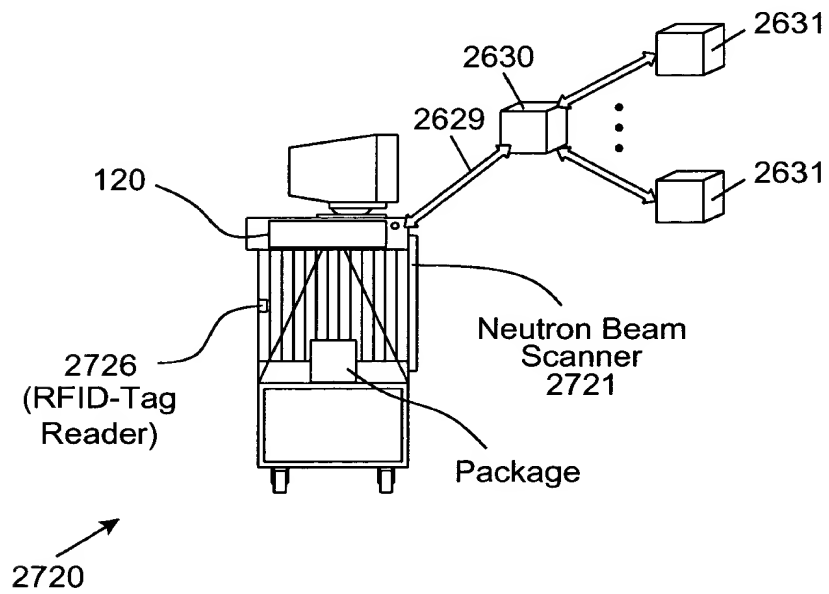


FIG. 71B

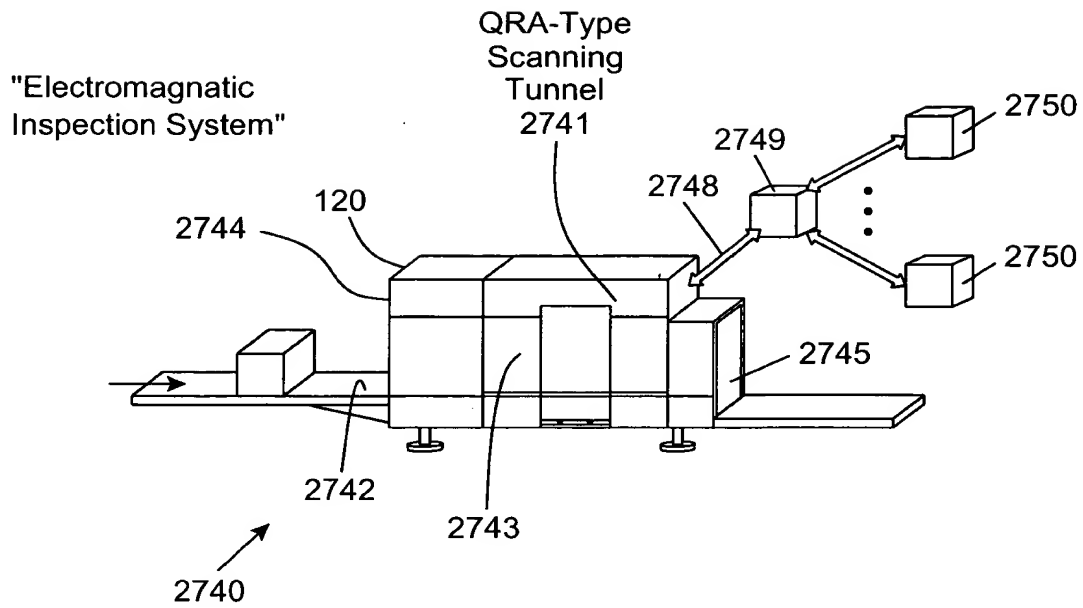


FIG. 72A

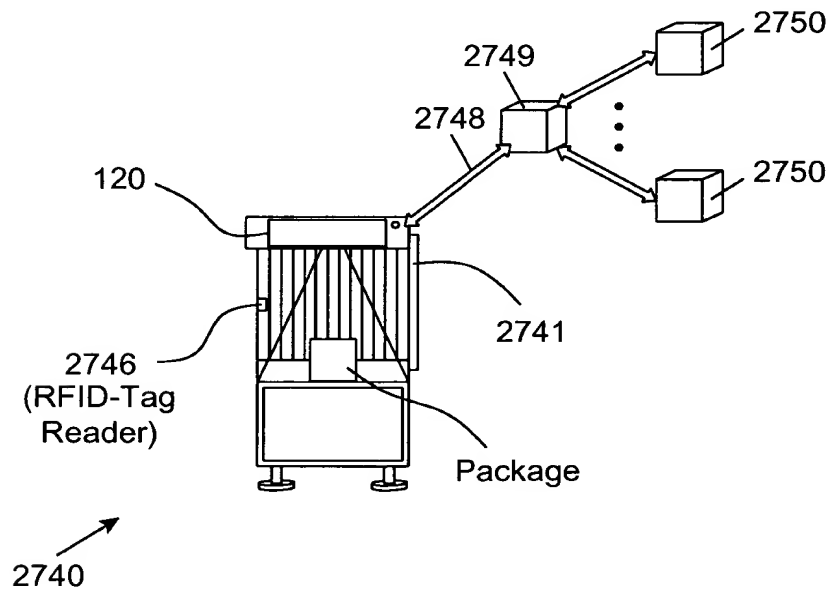
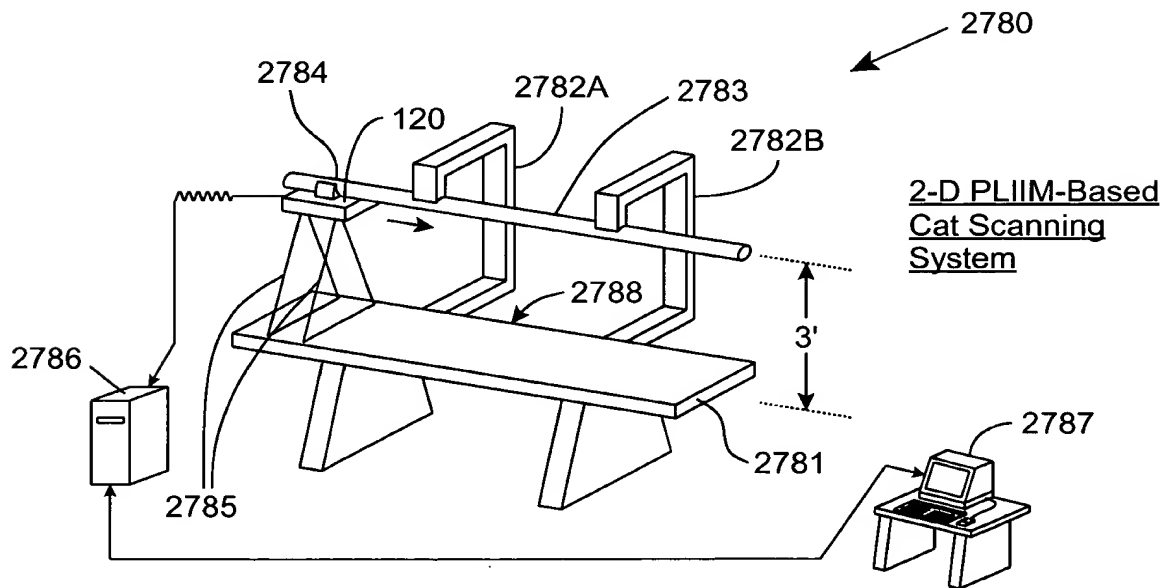
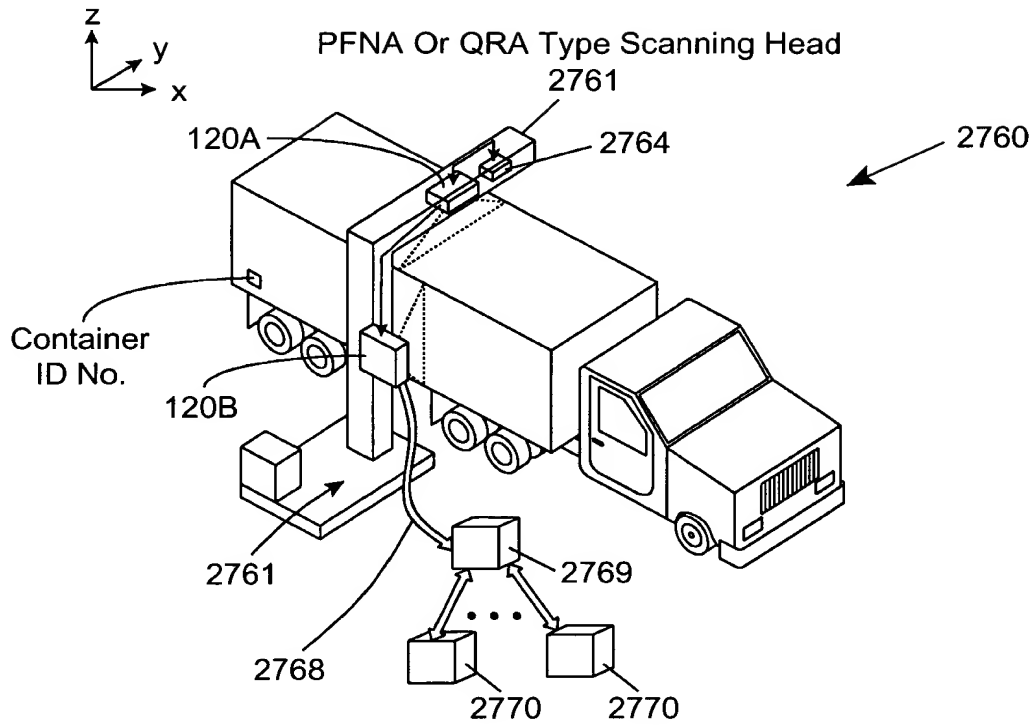
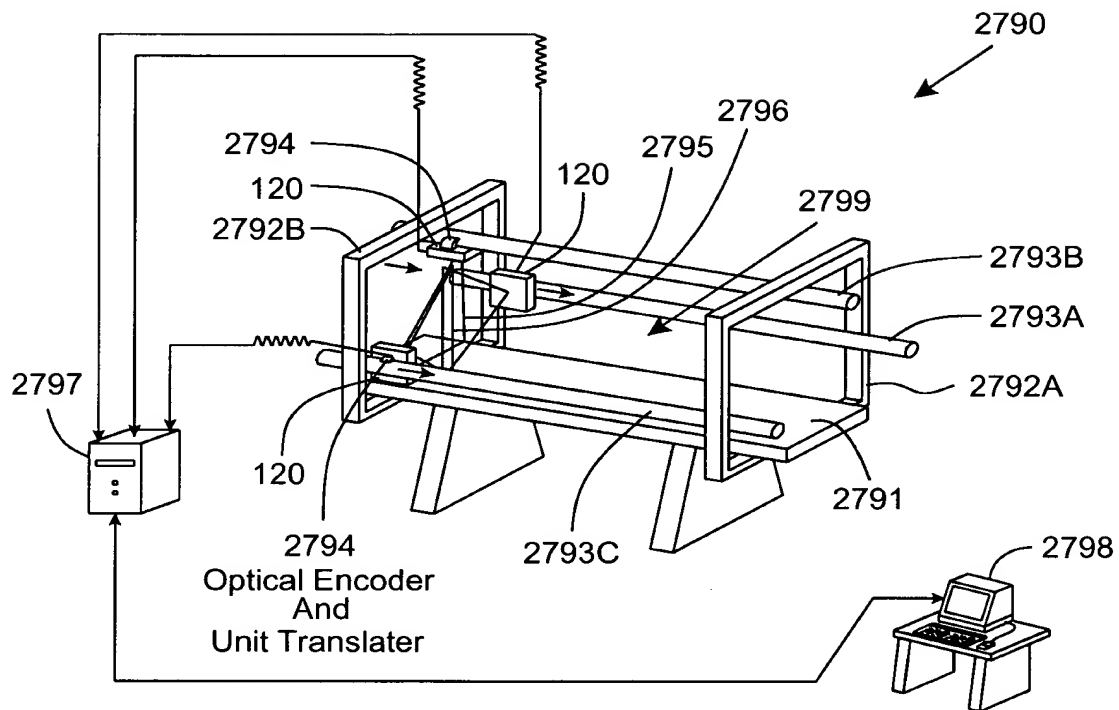


FIG. 72B







3-D PLIIM-Based  
Cat Medical  
Scanning System

FIG. 75

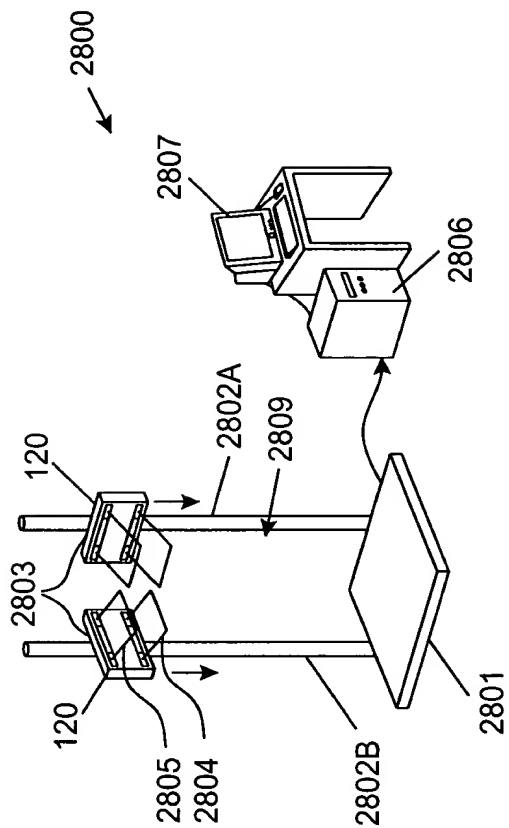


FIG. 76

"3-D Hand-Supportable  
 Mobile Digitizer"  
 2810

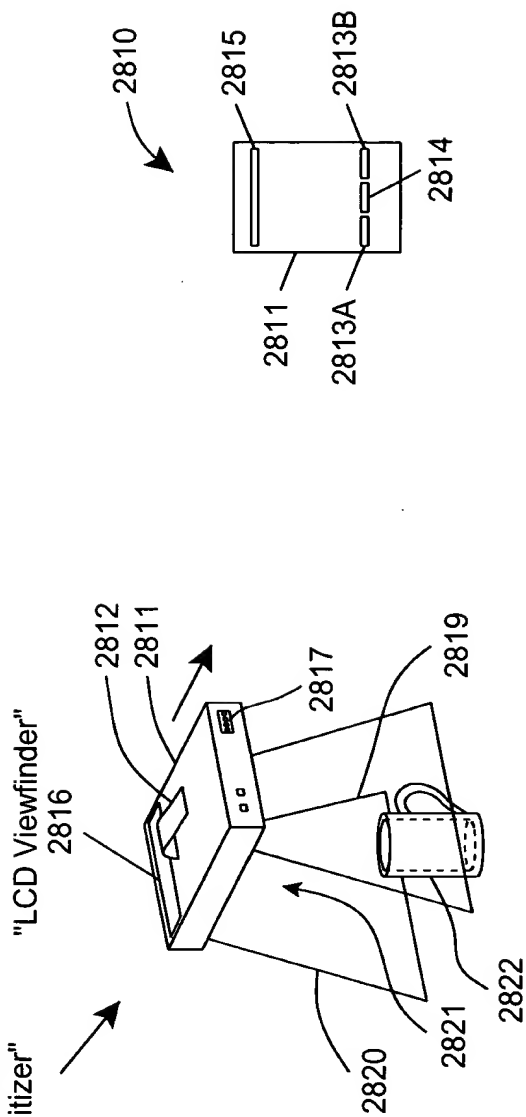


FIG. 77A

FIG. 77B

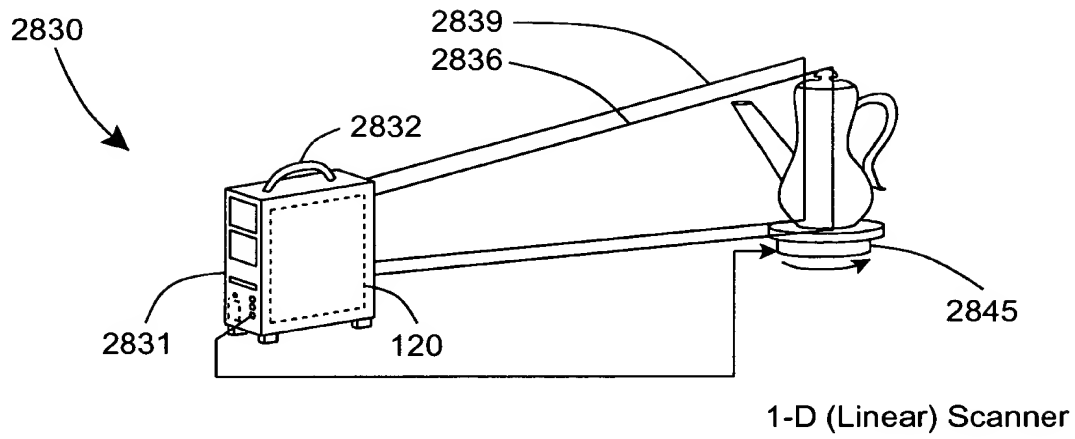


FIG. 78A

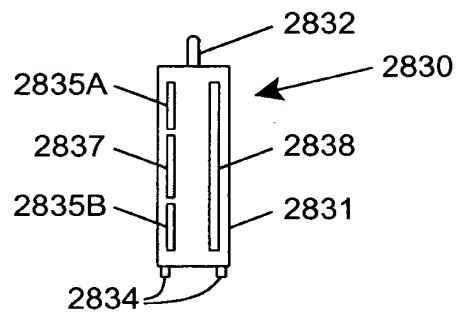


FIG. 78B

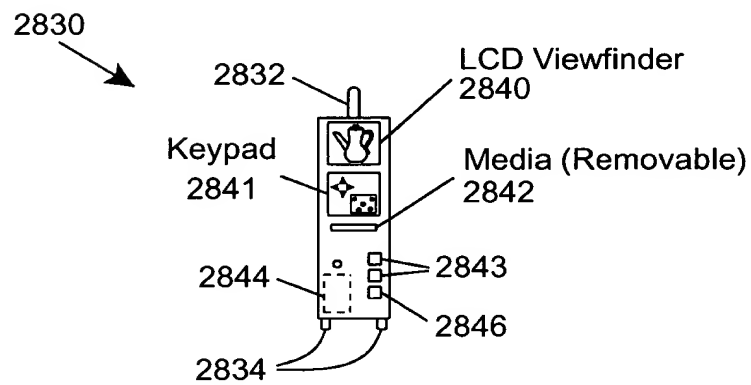


FIG. 78C

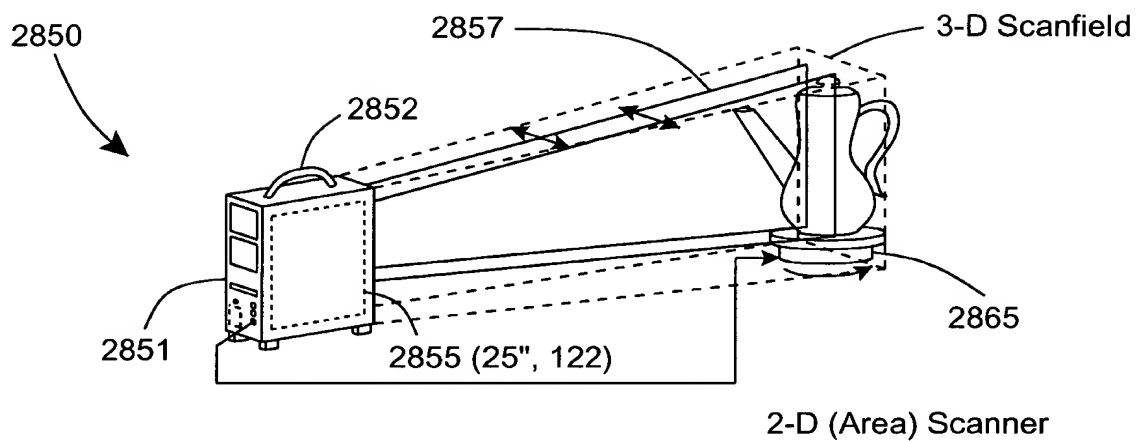


FIG. 79A

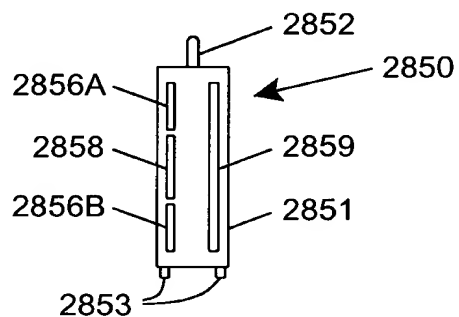


FIG. 79B

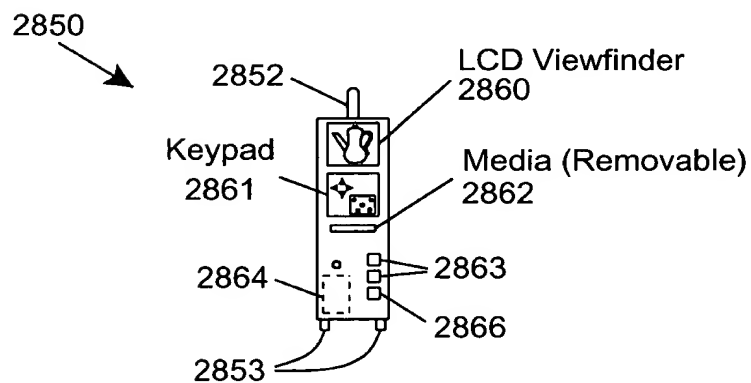


FIG. 79C

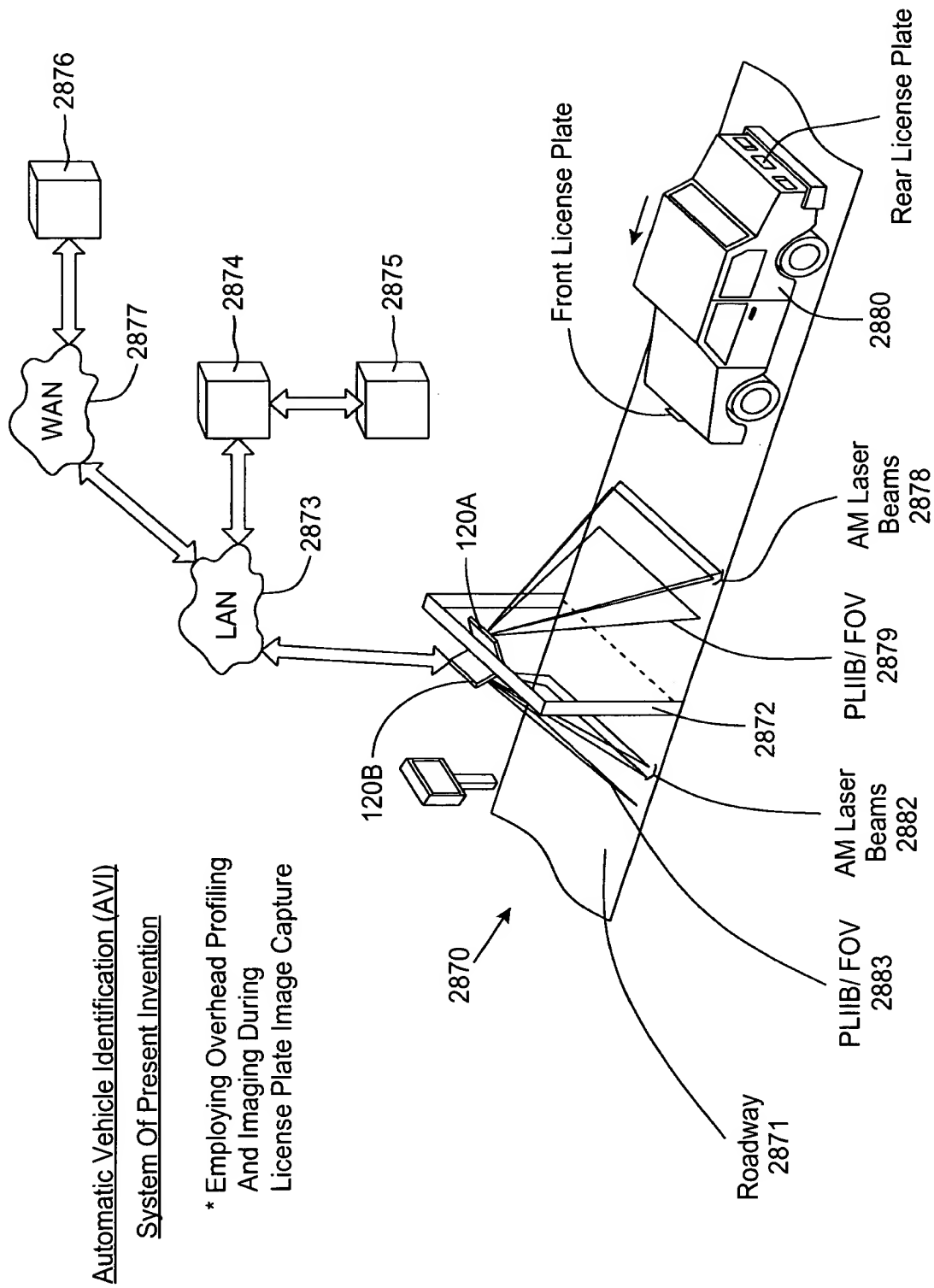
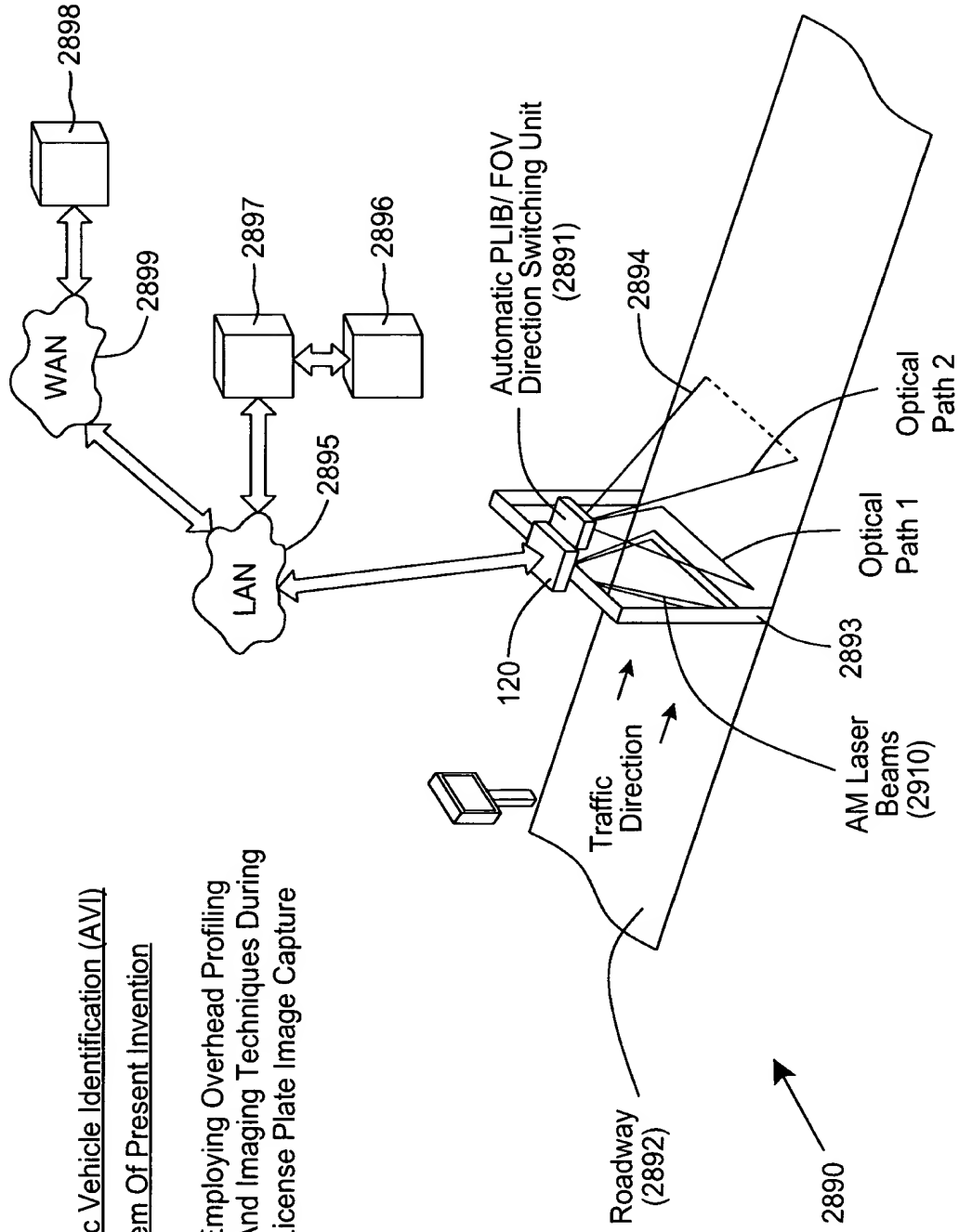


FIG. 80



# Automatic Vehicle Identification (AVI)

## System Of Present Invention

\* Employing Overhead Profiling  
And Imaging Techniques During  
License Plate Image Capture

FIG. 81A

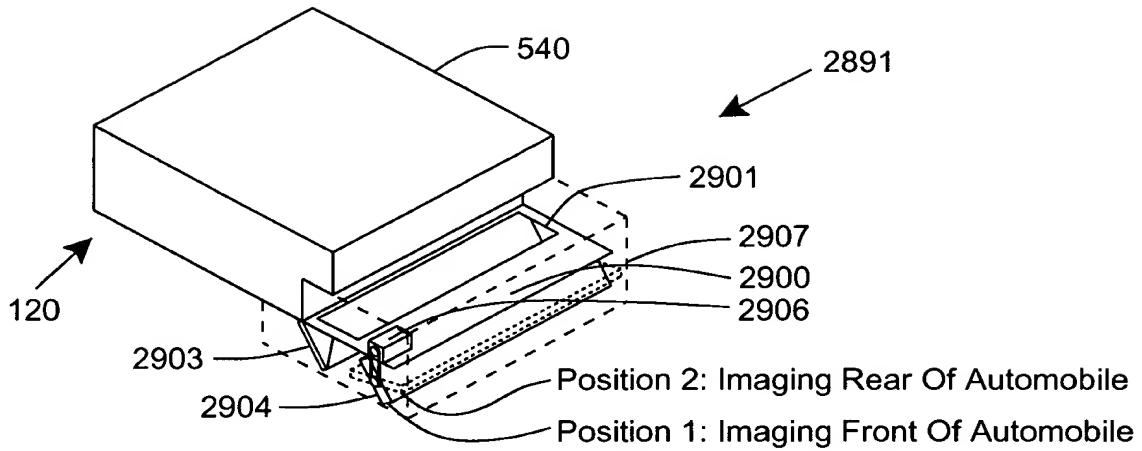


FIG. 81B

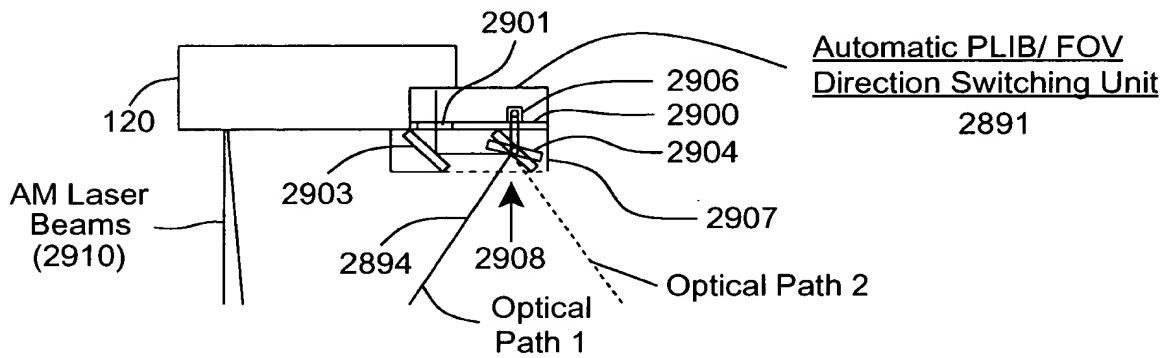


FIG. 81C

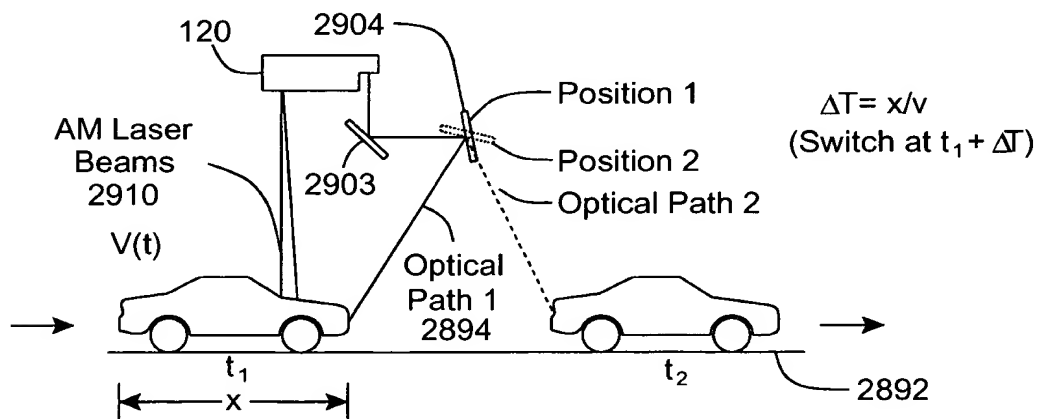
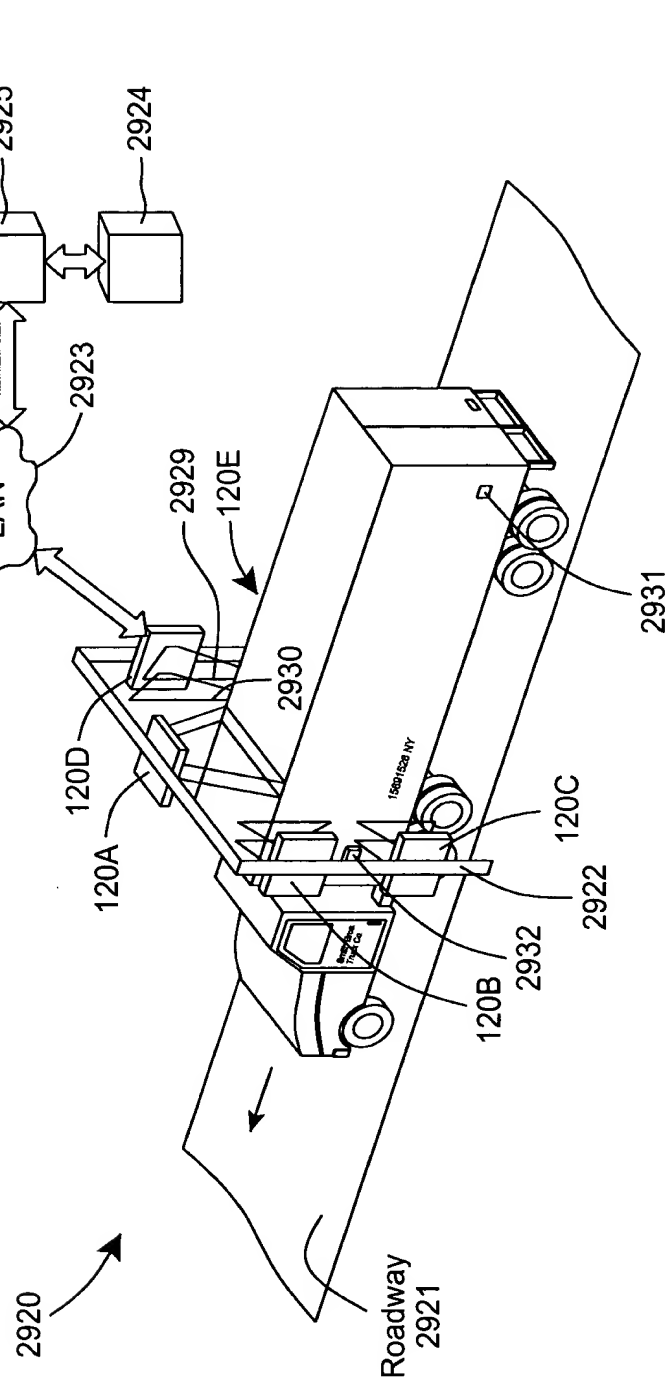


FIG. 81D

Automatic Vehicle Classification (AVC)  
System Of Present Invention



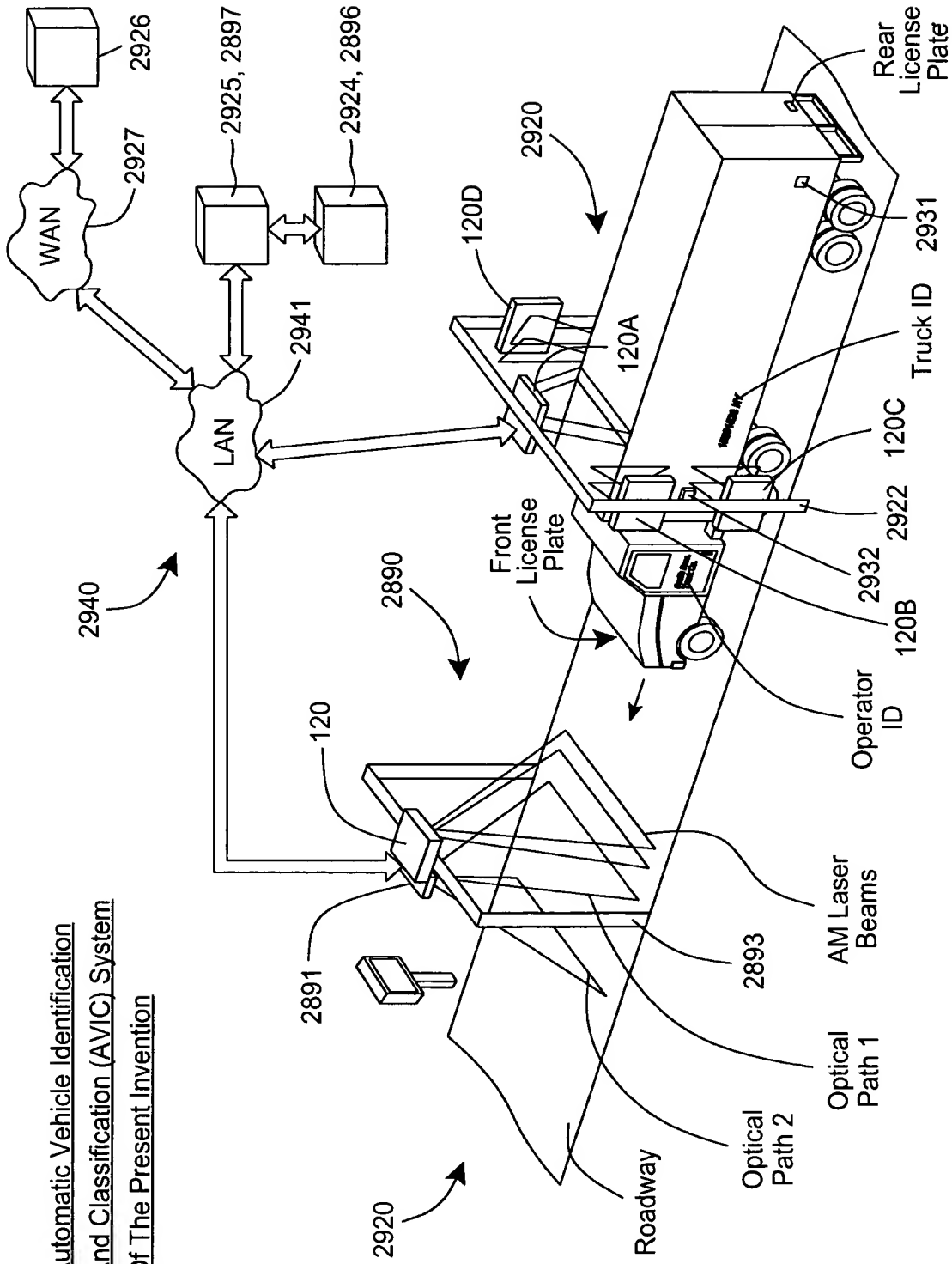
\* Employing Overhead And Lateral  
Profiling And Imaging Techniques

FIG. 82





Automatic Vehicle Identification  
And Classification (AVIC) System  
Of The Present Invention



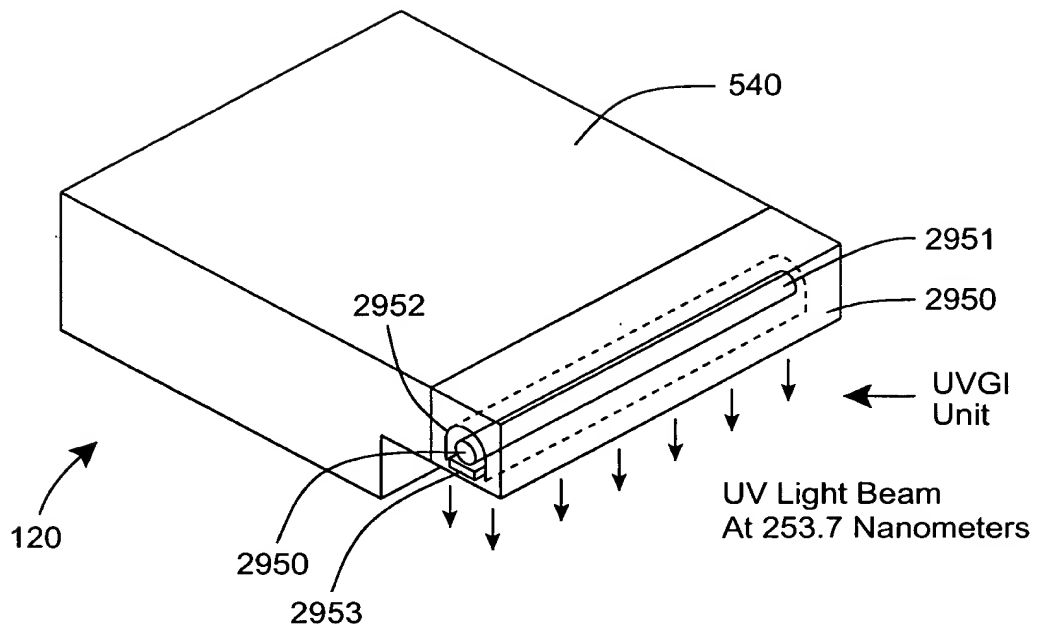


FIG. 84A

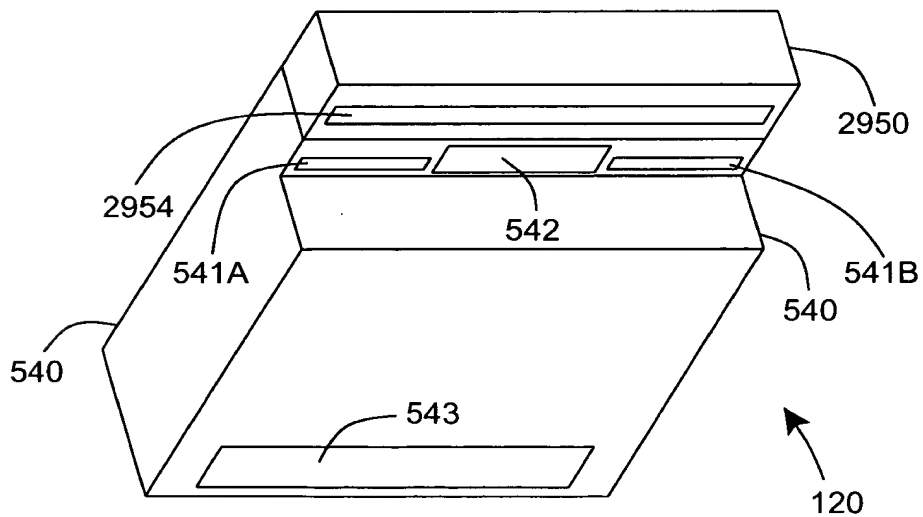


FIG. 84B